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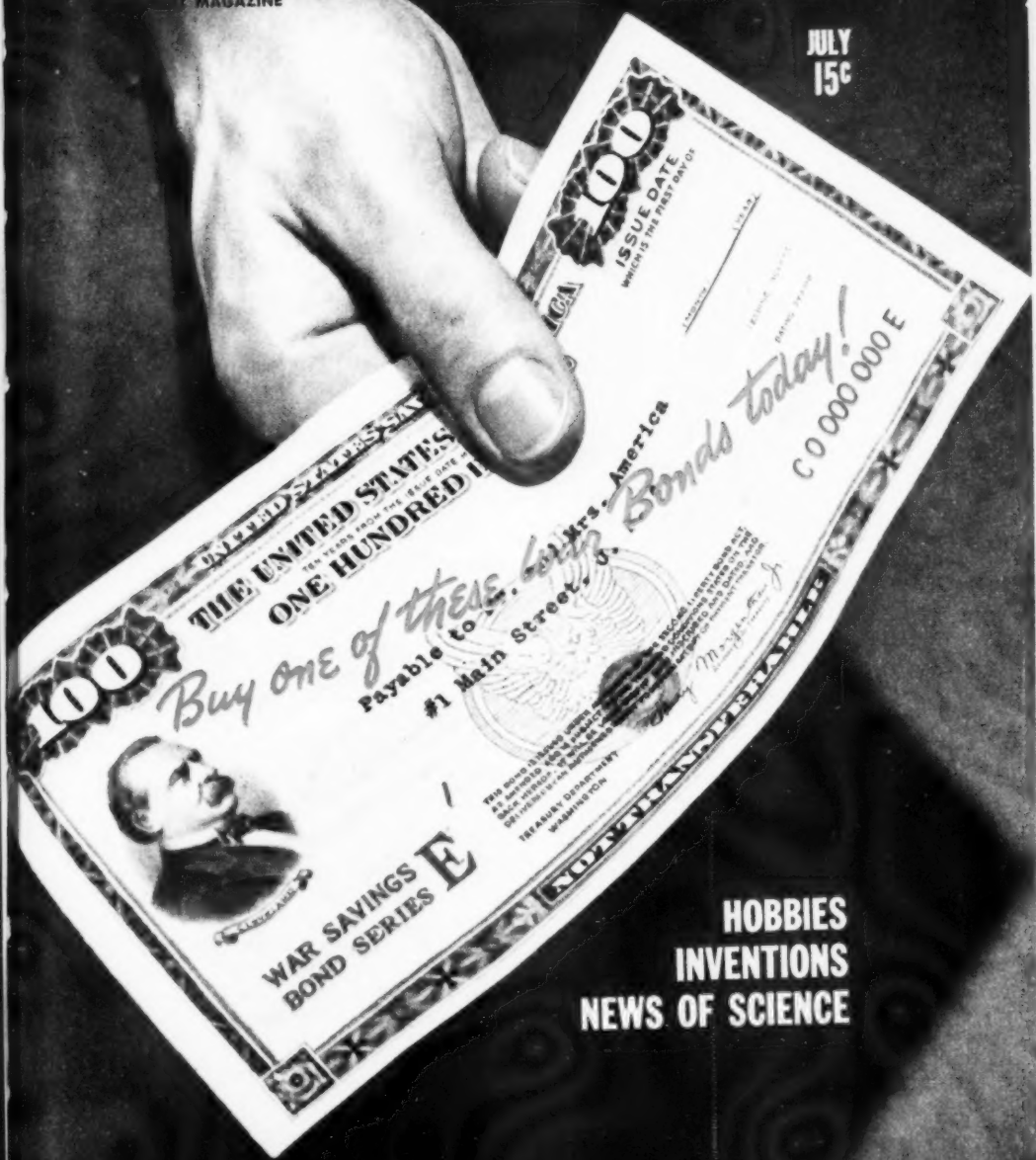

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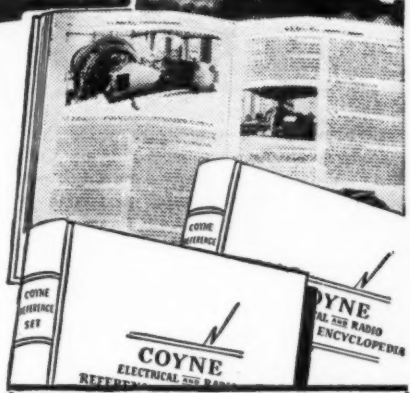

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YOUR INVENTION CLINIC

Conducted by

JOSEPH H. KRAUS

Mr. Kraus has been giving advice to inventors for more than 20 years. He will attempt to answer as many letters from inventors as possible in his column each month. Mr. Kraus will "call his shots as he sees them" in this column. Thoroughly versed on inventions and inventions procedure, he will never, under any circumstances, disclose any valuable secrets. He cannot answer questions relating to patent law. For such information, the Editors suggest you communicate with any one of the patent attorneys who advertise in MECHANIX ILLUSTRATED.

"Strike-me" Cigarette

B. R. Bailey, Throckmorton, Texas, submits a design for a cigarette with an ignitable end to be struck on the cigarette package. He wants our advice.

ANSWER: *For a number of years the "strike-me" type of cigarettes appeared on the market. We didn't like them; nor do we think you would. The chemical fumes, which first come off when the cigarette is struck, seem to permeate the tobacco and impart to it a rather bad taste.*

Why not try the trick yourself. Break off the head of a match, insert it into a cigarette and strike it on the package; then puff. It will take you one moment to make the test. You'll throw the cigarette away the next second, if you are an average smoker.

We feel sure you can do nothing with this idea.

Plastic "Dog-tag"

S. Calvo, MM 2/c, Dioaera Barracks 111, Camp Peary, Va., recommends a plastic identification tag.

ANSWER: *For the life of us we cannot see why anyone should want to make an Army or Navy "dog-tag" as described by you.*

It is very obvious that this tag will not wear well. It is in constant danger of destruction. For this reason, also, we do not believe it would ever meet with the requirements of the service. A metal tag is the only type which can go through flame and fire and still serve as an identification marking. We recommend that you forget about this idea entirely.

Needed Inventions

Francis Bradshaw, Vermilion, Alberta, Canada, asks us to suggest a few popular needed inventions, or a book.

ANSWER: *Although a number of books have been published on the subject of needed inventions, the inventions most likely to become successful are rarely listed in these books.*

A successful inventor is one who becomes dissatisfied with existing things and sets about trying to overcome difficulties and problems, or sees a need for a certain article and promptly proceeds to build that article. Listen to some of your friends when they say, "I wish someone would invent. . . ."

Take the humble cigarette tray. It gets gummy. It doesn't put out forgotten cigarettes; it is difficult to clean. Why not produce the perfect, simple, table tray, which will overcome all of these difficulties?

Again, there is the garbage can. Nothing is more unsightly or difficult to handle. You can purchase paper bags to line the inside of a garbage can, but that is not a satisfactory solution. A new garbage can is soon smashed up quite completely by handlers.

Again, the average pie pan is not satisfactory. A woman who tries to make a pie in the average pan never knows how that pie is going to come out. Sometimes she gets apples which are rather wet and, when the pie is cut, it is soupy. Why not some sort of an automatic syphon or drain, which will drain out the juices and give a nice solid pie regardless of the material with which it is filled. Some women use a gelatinizing substance in their pies, others use tapioca. But all of these substances change the flavor, color, appearance, and "feel" of the pie.

"Protected" Perpetual Motion

John H. Martland, Westcliffe, Colorado, submits a design for a perpetual motion machine with a chain revolving around three sprockets arranged in triangular form. Two sprockets are arranged vertically, the third to one side. The chain is weighted at intervals. The result is, as he sees it, that there are a greater number of weights on one side of the "lever" than on the other, hence the motor should run. A flywheel is to help it over the rough spots.

ANSWER: *You specify that your perpetual motion invention has been protected by two systems. These are not protections. The only way a satisfactory protection can be obtained is to have a patent issued to you through the U. S. Patent office.*

The rule of the patent office, as relating to perpetual motion inventions, is that working models of devices must be submitted. This you cannot do.

[*Continued on page 162*]

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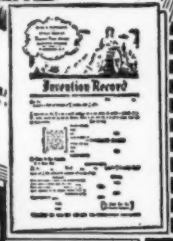

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Science In Color

When you open this copy of your favorite magazine you will see that something new has again been added—a whole section in fact, rotogravure—printed in beautiful full color for your enjoyment. We've decided to call this section *Science In Color,* because whenever possible we shall include in it new scientific developments which can best be illustrated with kodachrome photographs or natural color art work. Many other subjects in the fields of mechanics, sports, adventure and hobbies which lend themselves to color treatment will also be found in this section, and we sincerely hope that you will get as much kick out of it as we did in bringing it to you. If you want to sneak a quick peek at *Science In Color* before reading the rest of MI we'll forgive you this once—just turn to page 67 and don't tell a soul—except the neighbors and all your friends.

P. S. While you're about it remind them to buy that *extra* war bond this month, and treat yourself to one, too. The original of the MI cover design (in full color) can be located at any bank or post office.

Controversial Currents

Willy Ley's interview with Prof. Felix Ehrenhaft in the May MI gave you the lowdown on the indefatigable Viennese refugee who, puttering around in his modest New York laboratory, made the astonishing discovery that magnetism flows just as electricity does. A tempest has been raging in physicists' circles ever since this revolutionary news was broadcast. Nobody, however, seems to be willing to take time out to substantiate or negate the Professor's claims. Now, at long last, Waldemar Kaempffert, science editor of the New York Times, has come along with the first helpful suggestion we've seen.

After consulting with distinguished physicists, he proposes that American scientists set up some control experiments. For one thing let two identical magnets be rigged up, one to do electrolytic work decomposing water, the other to do nothing. If the first loses part of its strength while the second does not, the Professor definitely has something. Kaemffert further suggests that this experiment, and other related ones, "be performed by a scientific committee which would be appointed by the American Institute of Physics," with one or more competent newspapermen present. We heartily concur. Even in wartime it's pretty important to find out what the score is with a discovery that's claimed to be as revolutionary and far-reaching as Faraday's.

Coming Next Month!

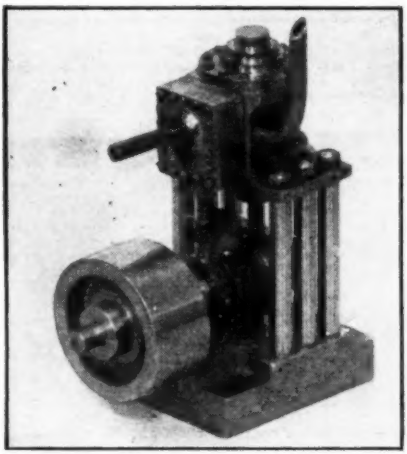
TOMORROW'S AIR TRANSPORT: An exciting glimpse at the giant passenger and freight transports that will speed over the world's airways after the war, including Consolidated-Vultee's new Model 39 and Budd's stainless steel "Conestoga" freighter. With many full-color illustrations.

DIVE BOMBER GUNNER: Rear Gunner Joseph Swingle, Jr., just back from the South Pacific, tells you what it's like to man the guns in carrier-based planes. Illustrated with some of the best action kodachromes to come out of this war.

BLACK AND WHITE MAKE COLOR: The story of C. A. Birch-Field's amazing invention—the Iriscope—which projects ordinary black and white film in full color. Illustrated in color, for the first time in *any* magazine.

[*Continued on page* 154]

MODEL STEAM ENGINE



This model steam engine was built by Fred Hass, of Denair, Cal., and it performs just like the big fellows. It is the slide-crank type, has a ⅝" bore and ⅝" stroke and turns up to 4,000 r.p.m. on 50 lbs. of steam. A $5.00 Workbench award and a Certificate of Merit go to Mr. Hass for his fine workshop project.

THE BIG BOYS' EYES

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An SO3C, trim little observation plane, is hurled from the catapult of a light cruiser. Scout pilots soar off in these Curtiss Seagulls during battle operations to direct fire of our big guns.

by Will Oursler

MI's Pacific Theater Correspondent

Scout pilots, the roving eyes of our fighting fleets, are under orders to avoid combat. But sometimes they forget.

ONE American plane, a flyspeck on the blue Pacific sky, circled low over the Jap atoll, perilously close to deadly black puffs of AA fire from enemy guns hidden in the palms below.

The pilot was barely turned twenty, but he knew well the risk of his job, how helpless his lumbering "observation scout" plane would be if any Jap Zeros came up for combat.

He did not allow his mind to think about what might happen.

Below him, several miles off the island, he saw the battleship from which he had catapulted a few minutes before. The ship moved in closer to the island for the bombardment. He saw the yellow flash of fire and smoke as the big guns blazed out the first salvo.

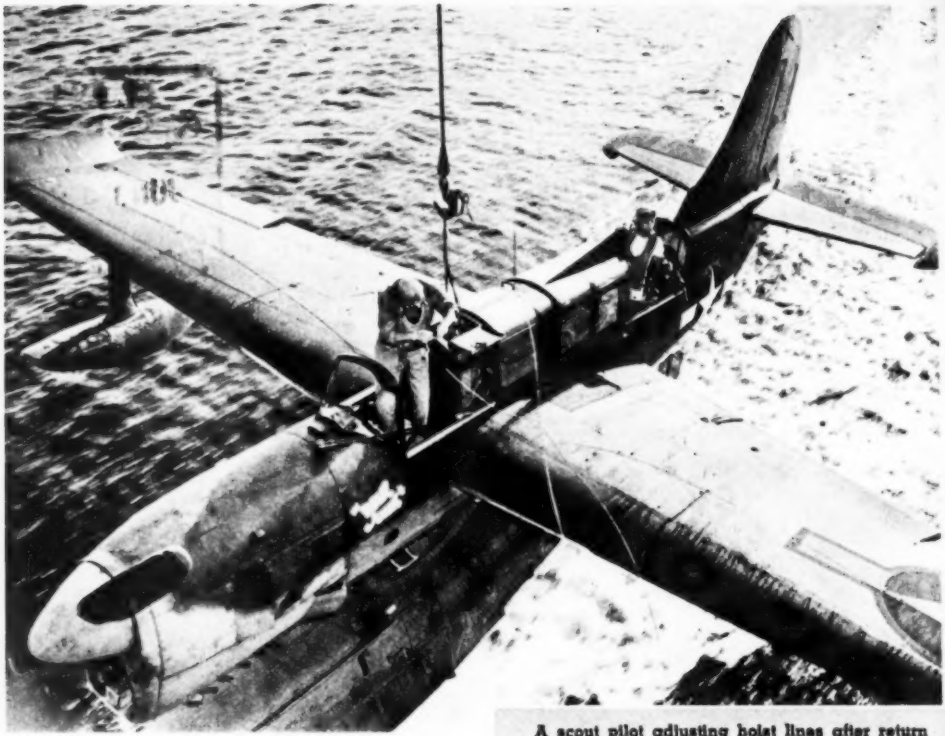
His hands tightened on the controls. The plane quivered and bolted up a hundred feet from the force of the salvo's blast. Shell fragments splattered against the plane, ripped holes in the wings.

The pilot's eyes were intent on the target area below.

"Your shells were over the mark," he reported back to the battleship, his voice crisp, matter of fact. "Bring your fire down."

The second salvo was short. The pilot reported again: "Bring your fire up."

The third salvo of shells from the big guns



A scout pilot adjusting hoist lines after return from a photographic trip. Standing in the after cockpit is a Navy photographer with camera.

demolished the target, a concealed Jap position. The ship's guns turned to the next objective.

All through that morning, as high-explosive death raked the enemy, the pilot in his Ugly Duckling plane circled above the Jap island, dodging enemy flak and trying to keep high enough not to be blown to bits by our own salvos—carrying on with cool precision his task of spotting where the shells were landing.

It was almost noon when he turned away from the island, landed back in the water near his ship and was hoisted aboard.

"When's chow?" he grinned. "I'm hungry."

The "spotter" pilots on battleships and cruisers serve as the "eyes" of the ship's big guns. In all aviation there are few jobs as hazardous. For the spotter's main task is to stay directly over the enemy and "call the shots." Armed only with light machine guns, he is not supposed to fight, would stand little chance against an enemy fighter. His prayer is that nothing ever gets close enough to him to fire.

The pilots and radiomen of the planes travel as regular members of the ship's company. Because of their unique task, they and their crates are the object of innumerable wisecracks from shipmates. "Don Quixotes of the Air," they are called. Or as a variation, "Rover Boys at War."

But the kidding is only skin deep. Behind it, all who ride with the pilots recognize how vital and risky is the assignment they have.

First on the hazard list when a scout is out on a job is the chance of being hit by fragments of our own shells. "We have to fly so low, see," one pilot told me, "to spot where the shells are landing. Half the time we're right over the explosion."

The flyer smiled. "Of course, that's not all we have to worry about—if we bother to worry. There's anti-aircraft fire to watch out for. Then there's the chance of enemy planes closing on us. And especially when you're on invasions, there's always a lot of your own planes buzzing around you, bombers and what not. You have to watch out all the time for possible collisions."

Decorations are rare among spotter pilots

but their courage and tenacity are legend in the fleet.

During the Marshall Islands invasion one spotter was caught in a heavy squall. Storm or not, he determined to continue calling the shots. He dropped below the clouds, down to 300 feet—a sitting duck for enemy guns if they decided to open up.

At that height, unconcerned with his own danger, he kept on with his spotting. His fuel was getting low. It was too late to pull up. He reached out desperately, trying to shift over to the reserve tank.

It was no go. In the brief instant of switching over, no gas fed through the lines. The plane twisted crazily, plunged down into the water, turned upside down.

Groping under the surface, the flyer extricated himself from the plane, helped out his radioman from the seat behind him. They pushed their way to the surface, inflated their rafts.

The squall had passed. Above them they saw patches of blue sky. Half a mile away, they saw the glittering white beach of a jungle island.

Neither pilot nor radioman had any idea who controlled the island—our forces or the Japs. But they could not sit on their rafts and wait.

"We've got to take the chance," the pilot said. He drew out his .38. "If it turns out to be Jap we'd better use this on ourselves. Wouldn't stand a chance against them. I'd rather get it over quick."

They started to paddle. Progress was slow in the heavy sea. They saw a speck off on the horizon. It was growing larger, coming closer to them. It looked like an American destroyer. Rescue was on the way.

Half an hour later they stood on the destroyer deck, dripping, telling their story to the ship's commander.

"Damn lucky we reached you," the commander said. "That island—the Japs still hold it."

During the Attu invasion, spotters were fighting not only the enemy but the elements as well. High winds and dense fogs, thick cloud banks covering the horizon, made spotting at times almost impossible. Yet the job had to be done.

"Weather was so thick," one pilot told me, "that we were flying half the time about 100 feet off the ground. Lucky the Japs moved out with their guns or we would have been gone geese."

Possibility of encounter with enemy planes was a chief worry of the flyers at Attu. With heavy clouds for cover, Jap Zeros could sneak in and be on top of American planes before anyone knew the enemy was near. The sneak play is standard with Japs, and they remained true to form.

One scout had been up for several hours when he saw a streak coming out of the clouds behind him. It was a Zero, already diving for attack.

The pilot had no time to worry over any plan of defense. He swung his plane sharply and started to run, heading toward a mountain whose nose stuck up some miles off.

The Zero kept coming. As the pilot neared the peak he headed in a close circle for the other side of the mountain, the Zero still behind him.

Then began the strangest game of ring-around-a-rosy ever played. The scout plane kept in close to the jagged crags, clumsy and slow but still [*Continued on page* 138]

Power to launch scouting planes from battleship and cruiser decks is provided by giant catapult shells. They release expanding gases when fired, causing plane-toting cart to whiz down catapult track.

WAR

BRITISH ACK-ACK

THESE are the potent "Z-guns" of England. They have defended London for two years against Luftwaffe raids. Rocket virtues: Four mile range—featherweight construction compared with other ack-ack guns—concentrated fire from one spot. Rocket drawback: Inaccuracy. They burn powder two seconds, continue on momentum.

Light, portable rocket guns are set up quickly and in great numbers. It means a terrific barrage against planes.

With great rushing noises rockets take off from the multiple barrelled weapon. Jet of flame lasts less than a mile up.

And here's a rocket that takes a parachute aloft which trails anti-dive bomber wires. It has successfully defended merchant ships.

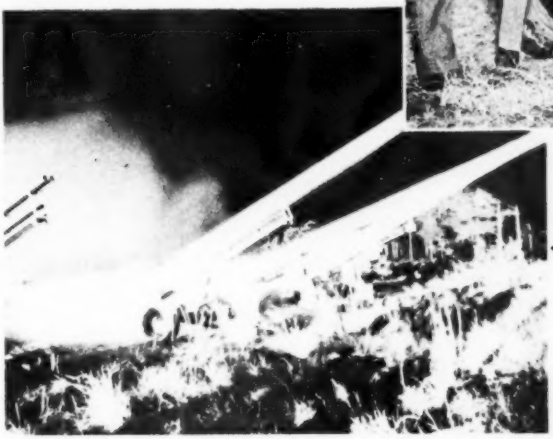
Single rocket guns. Note back-blast from second gun's breech. Jet has nothing to do with propulsion. These are fixed guns.

ROCKETS

AMERICAN TARGET

NOT having enemy aircraft in our skies, we are using rockets here to train our ack-ack gunners. Being tiny targets and achieving a speed of 450 m.p.h., the rockets give our boys crack practice. This range is at Camp Davis, N. C. If the .50 cal. machine guns don't nail these flaming targets soon after the take-off, they're out of range and out of sight.

Launching crew sets a three-finned rocket target into its mobile carriage. These units are built like trailers.

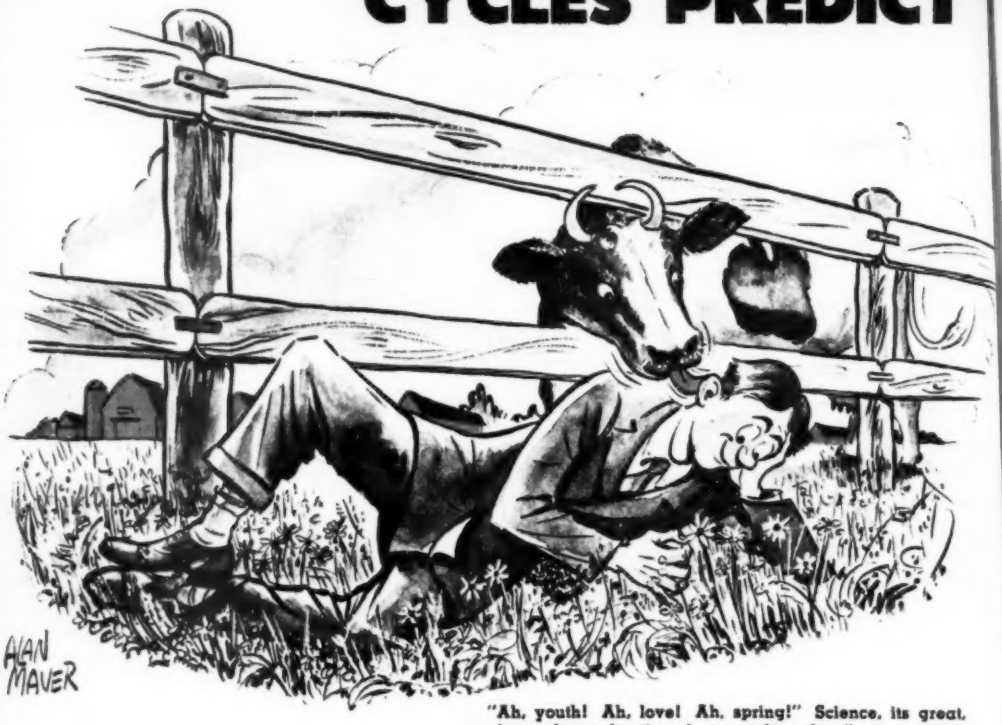


In a blaze of light, target rockets leave the rails of their carriers. Artillery men practice their shots day and night.

The anti-aircraftsmen mount their half-track on the firing range, crouch behind their .50 cal. guns, await firing signal.

These are the targets the gunners track, zooming rockets (faster than planes) that leave a cloud of dust over their carriages.

CYCLES PREDICT



"Ah, youth! Ah, love! Ah, spring!" Science, its great, glassy heart beating faster, takes the "young man's fancy" into the laboratory, tests it, and finds it scientific.

"IN THE spring a young man's fancy—" No need to finish that quotation. Everybody knows that love blooms in the spring. The poet knew it as well as the rest of us, but he didn't know why. He was really singing a song of cycles—the basic cycles of race perpetuation.

If, somewhat brutally, we revise his famous line in the light of newer scientific knowledge, it comes out something like this:

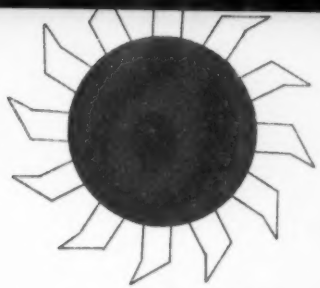
"The reproductive function is marked by many cycles. Many of these can be predicted accurately to forecast days of fertility, the months in which the most births will occur, the onset of maturity, the long-term rise and fall in birth-rates, shifts in moral concepts. The annual cycle reaches a peak in spring, declines in the hot months of summer, swings upward again in autumn and falls again in mid-winter."

There you have less poetry but more significance. You do not need to be a cycle expert to predict that June will be the most popular month of the year for weddings. But if you know your cycles you will understand why. Reproductive efficiency is just one index of health and vigor. June, in our temperate climate, is the month when human beings are at the peak of what Prof. Ellsworth Huntington calls the "basic animal rhythm." Not only are more children conceived at that time, but they are huskier, longer-lived, more likely to become eminent.

The mechanisms of reproduction, observable throughout nature, are the most extraordinary organic timepieces in the universe. Their regularity is such that they are the very essence of cycles—cycles from which life begins. Dr. George W. Corner, authority on glandular physiology, cites the case of the palolo, a worm living on the sea bottom, which swarms to the surface to breed 4 nights out of every year, during the new moon and full moon of October and November. Certain seaweeds fruit only at the highest tides. The domestic fowl, producing an egg a day, has the shortest cycle; the locust, with a 17-year cycle, the longest.

In human beings the 28-day cycle is by far the best known. It has no connection with

THE FUTURE



by Donald G. Cooley

Is the U. S. doomed to decline because of the lower birthrate? New facts on how temperature and the reproductive cycle affect this vital topic.

the lunar cycle of the same length. Indeed, the human cycle fluctuates within wide limits. Cycle scientists have been sweeping aside much of the ancient superstition encrusting the subject, learning about interlinkings of glands whose hair-trigger releases set an amazingly complex physiological train in motion.

It is only within recent weeks that knowledge of the cycle has advanced to such a stage that days of fertility can be predicted with scientific accuracy. Doctors are using the new knowledge in order to help childless couples become parents. Conception can take place only in a few days following ovulation, the brief period in the cycle when the egg is released. New methods of charting individual cycles enable these days to be determined with considerable accuracy.

Body temperature is the clue in determining date of ovulation. Temperature fluctuates, like ups and downs in the stock market, and the menstrual cycle has a typical curve. During the first part of the cycle the temperature is relatively low. Then it shows a rather sudden drop, rarely longer than a day or so. This is followed by an abrupt rise in temperature, which remains high until it drops sharply just before the next menses.

This may well be considered the most basic cycle of human life, for the conception of new life can occur only during a few days of the typical 28-day cycle. These days—the date of ovulation—are revealed by the brief, sudden drop in body temperature which occurs, roughly, around the midpoint of the cycle. The ensuing few days when temperatures are rising are the days of fertility—a cycle of biological time dating all the future generations of man.

Dr. Pendleton Tompkins, who described this charting method in the *Journal* of the American Medical Association, warns his women patients that temperatures must be taken very accurately, since fluctuations are rarely greater than three-fifths of a degree. He advises them to keep careful temperature records for two or three months. This gives a series of monthly graphs and enables prediction of fertile periods to be made. The early drop in temperature (looking, on a graph, like a stock price that has dropped and then suddenly started to climb) marks the beginning of fertility, and by such information many women who feared themselves sterile have been enabled to bear children.

The cycle mentioned is of course confined to the mothers of the race, but male parents have similar responses. Temperature, indeed, seems extraordinarily important in all reproduction. Paternal germ cells cannot long retain their vigor at temperatures as high as those within the human body, and nature has devised remarkable biological thermostats to make sure that these cells are produced under optimum temperature conditions. Long exposure to extreme heat can easily render a man temporarily sterile.

Since temperature is one aspect of climate, and climate is marked by definite cycles (see MECHANIX ILLUSTRATED, April, May) we have several factors acting in harmony to determine the vigor and numbers of human beings. The best periods of fertility, producing the most vigorous offspring, come when outdoor temperatures average around 65 degrees. There is a drop both in fertility and vigor when summer temperatures range above 70 degrees, just as there is in winter when the thermometer drops below 40 degrees. During the great Mid-Western heat wave of 1934, the conception rate dropped 30% in months when the temperature rose above 100 degrees at mid-day.

Animal studies throw further light upon temperature and fertility. Dr. Clarence Mills, Professor of Experimental Medicine at the University of Cincinnati, is a noted authority on the effects of climate upon man. He has worked with hundreds of white mice, keeping whole families of them at controlled temperatures. At 65 degrees, every mating of these little animals is fertile, the litters strong and healthy. But at 90 degrees con-

Warm-climate people have lower birth rates. The Pilgrim father was a more prolific progenitor.

ception is very difficult to achieve; the offspring are small, puny, and many are stillborn. The temperature at which complete sterility is produced is 94 degrees.

This contradicts the popular belief that people of tropical climates reach maturity earlier and are much more prolific than their northern brothers. Dr. Mills points out that this belief is completely fallacious. The girl who reaches womanhood earliest is not the tropical beauty in a grass skirt, but a northern lass in regions such as the upper Mississippi basin. The cycle may be as much as three years earlier in the northern girl. And the "hot climate" girl cannot match her colder sister in fertility.

It is true that warm-country natives are generally more passionate in behavior, their moral codes less rigid. Here climatic cycles seem to play a dominant role in shaping moral customs. Passionate behavior is more typical of warm-climate people, yet they have lower birth rates. People of cooler climates, much more restrained and even puritanical, have higher birth rates. Cycle scientists suggest that a form of compensation is at work.

This is substantiated by some astonishing experiments with white rats conducted by Dr. Kenneth Moore and Dr. Leo Hellmer. These scientists maintained families of rats at temperatures ranging from 55 to 90 degrees. The conduct of the cold rats won them the nickname "Puritans." They were modest, restrained, but practically 100% fertile. The behavior of the hot rats, however, was so noticeably different that they were called "public neckers." But despite this, they could not match the cold rats in fertility. In fact, after four generations the "public neckers" died out unless new blood was added to the colony—their activity could not prevent race suicide. They were also neurotic, vicious, and uninterested in caring for their young.

Conditions imposed by temperature cycles may matter little in individual reproduction, except to individuals. But the total effect upon nations can be tremendous. The life of nations is bound up in their birth rates. Vigorous nations and "Golden Ages" are associated with increasing birth-rates. Yet a long birth-rate cycle in European countries has been generally downward for at least 80 years. It was serious enough to drive dictator nations to vigorous efforts to change the trend, yet in spite of all fantastic measures they have failed.

Why? Probably the most impressive an-

swer comes from Dr. Raymond H. Wheeler of the University of Kansas who has charted, with painstaking care, hundreds of cycles running back for centuries. Dr. Wheeler suggests that artificial efforts to increase birth-rates inevitably failed because they were bucking a cycle—cyclic factors which impose themselves on man so powerfully that he cannot obey deep, mysterious rhythms of nature and at the same time fight them.

The decline of birth-rates in recent decades has been strikingly linked with excessive temperatures, Dr. Wheeler finds.

"All known declines in human birth-rates in history have been associated not with wars, but with hot droughts," Dr. Wheeler says. "Conception declines with increase in temperature above certain limits. The human birth rate, and presumably the animal, declined during the excessively warm 1920's and 1930's. Dictators tried to get it back to normal, but without success. There were only four regions in the U. S. where the birth rate did not decline during 1920-1930, and those were in mountainous areas where it is cooler."

This is an instance—constantly recurring in cycle studies—where short cycles repeat themselves in longer rhythms, some so long that they exceed the span of human life and are not easily recognized. But here we see, on an international scale covering decades, the repetition of a clearly defined annual cycle in which conceptions decline during hot summer months, increase in the cool autumn.

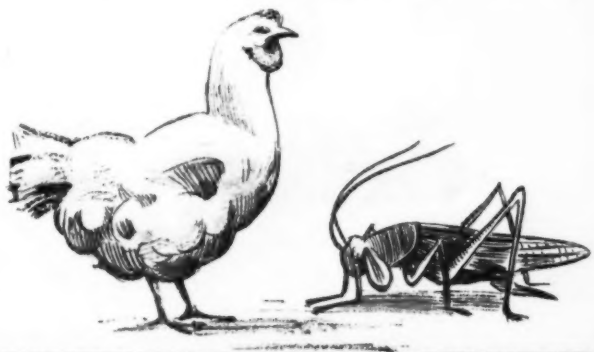
What birth-rate situation can we in the U. S. anticipate for the future? Few problems are more portentous, for a declining birth-rate, long enough continued, will doom any nation to second-rate status. Probable future course of climate is well charted by the work of Dr. Wheeler and others. The answer is encouraging. The world is seemingly entering into a period of greater coolness and Dr. Wheeler has predicted that four out of the six remaining decades in this century will be colder than average. This coolness may well work to increase fertility. There seems little danger that we are on the verge of race suicide, and the abandoned conduct which typically accompanies decreased fertility, such as characterized Rome before it fell.

Many thinking men are exercised over the potential upset to world balance of power posed by teeming tropical races. Areas which we have never thought of as industrialized, such as India, are now aburst with hundreds of new factories devoted to implements of war. We think of ourselves and our white brethren as dominant in the world, but certainly we are grievously outnumbered.

But here, again, cycles of reproduction, and the factors accompanying them, indicate that population isn't everything. Along with the more abandoned conduct of warm-climate peoples go accompanying characteristics: they are more effeminate, physically weaker, less aggressive, undemocratic, less resistant to slavery or tyrants. They are emotionally less stable, more self-indulgent, and their sexual attitudes are merely one aspect of response to unchangeable environment.

Every parent naturally wants his child to be the huskiest, smartest, and best-looking kid in the neighborhood. Cycles in human reproduction not only give parents a means of spacing the birth of their children, but of making sure that their birthdays occur during seasons which afford the best possible chance of success in life. Of course it is the date of conception rather than the date of birth which is important.

For instance, according to Dr. Mills, children conceived in midsummer heat have their chances of entering college cut in half. They will reach maturity earlier if conceived during winter cold. To some degree the future course of an infant's life is determined before he is born, according [*Continued on page* 144]



The domestic fowl, producing an egg a day, has the shortest reproductive cycle—the locust, with a 17-year cycle, the longest. Certain seaweeds fruit only at highest tides.

I WAS A CONGO "HAM"

by Commander Attilio Gatti

In which a wrecking crew of chameleons, elephants and hippos makes extremely short shrift of a short-wave station.

MY CAREER as a "ham," a short-wave radio amateur, was jerky, troublesome, harassed, and—on the whole—not exactly a howling success. Its origin can be traced to Mrs. Dorothy Hall, of Springfield, Long Island. In 1938, while I was organizing my tenth expedition to Africa, this dynamic lady began to talk, and I knew I was in for something.

Let me explain that Mrs. Hall—"Dorothy" to thousands and thousands of hams the world over—is among the most experienced and popular short-wave radio amateurs of America.

"An expedition like yours *must* have a short-wave station," she went on telling me. "Wherever you are camped, you and your companions can talk to your friends in the States, give news to your relatives if they are worried about you, send out an S.O.S. if you need something in a hurry. But there is more. Usually, how many times a month can you get or send mail?"

"Well," I said, "most of the time twice a month. If we are lucky. If we are not too far from the road of the mail-truck. If rains haven't washed away a bridge. If. . . ."

"There you are," Mrs. Hall clinched the matter. "In the Belgian Congo practically every post-office has a short-wave station. Once you are recognized by the government of the colony, you have the right to make a schedule with the nearest post-office. Every time you have to send or receive a telegram, instead of waiting weeks, maybe months, you just read it into your mike or listen to it in your receiver. And besides—"

There and then I went into the "hamming" business. A good manufacturer undertook to build for us a special receiving and transmitting set adapted to the conditions we would find in the equatorial jungle. Mrs. Hall offered to make her W2 IXX station our "mother station," the one which would watch out for us, take our messages, give us counsel in case of trouble and so on.

Our station was christened OQ5ZZ, OQ5 being the international name for Belgian Congo, and ZZ the letters assigned to us by the government of the Colony. Charlie Whitskey, our chief engineer, volunteered to become my assistant. And with the appropriate amount of nonchalance, I began to mention the matter right and left.

"Well," I would say, "so long, old chap. And remember—any time you wish to talk with us, just get in touch with our mother station."

"Gee! D'you mean to say I can phone to you down there in the middle of the jungle?"

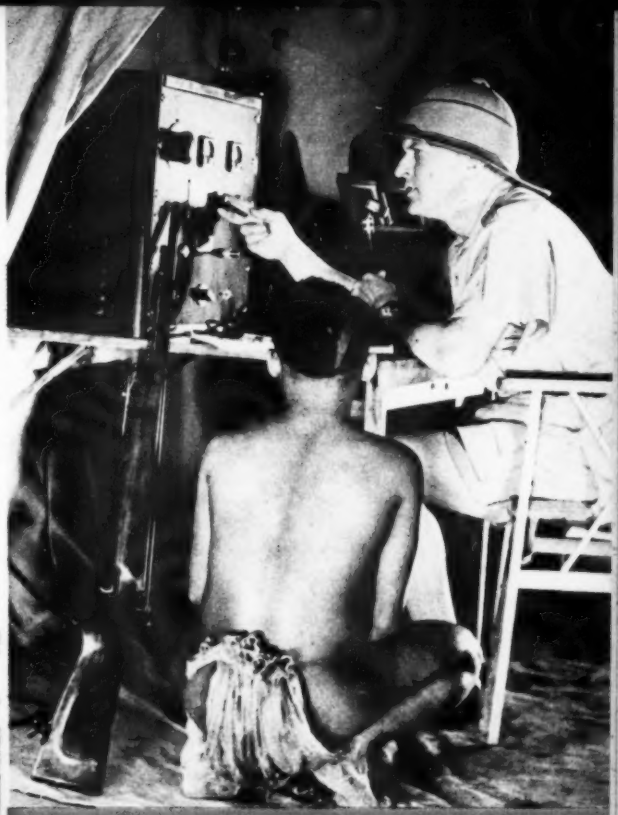
"Sure. Just give a buzz to Mrs. Hall. She will let you know when we are on the air. All you have to do is go to her home and talk to us. Or, if you simply want to hear how we are doing, just tune in your set on

Here's the site of the ill-starred station, OQ5ZZ, buried deep in the Belgian Congo. Irate elephants kicked it around plenty.

the short-wave dial. All you have to remember is Mrs. Hall's address. And that our radio frequency is 14.380 kilocycles. Our wave length, 20 meters. Is that clear?"

Neither Charlie nor I had ever used a short-wave radio set before. But we had learned practically all there was to it. The general idea, you see, was to keep in mind that short waves bounce and rebounce over the earth with thousand-mile leaps. Of course, they would go in every direction. So, if they didn't reach America by the shortest way, from the west, they were sure to go around the other way. Or by the North Pole. Or by the Antarctic.

At any rate, following one route or another, they would get there. Nearby, of course, nobody could get our waves, because of the "skip"



Commander Gatti was bewildered by his jungle short-wave set. "Mobile dial hands showed no signs of life, while stationary ones shook and wigwagged with shameless gall."

This hippo proved to be an ugly customer. He and his mates, frankly anti-ham, descended on Gatti's radio station and left it a shambles.

zone of the first bounce. But, in the case of a post-office, we could force that huge skip zone to shrink to a couple of hundred miles, by using the antennae specially supplied for the purpose.

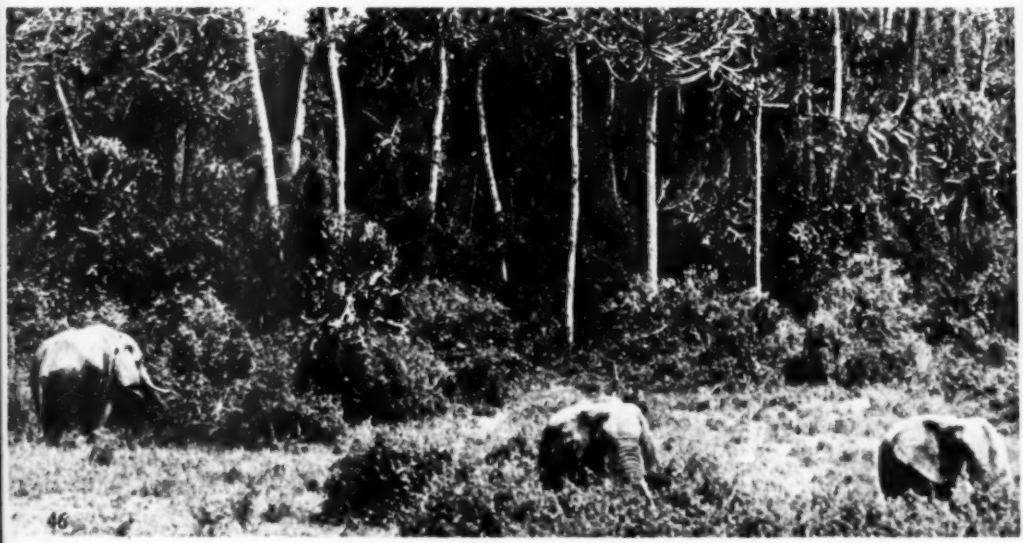
As for working the station, why, it was elementary. All we had to do was to plug in a cable from one of our 1500 watt, 120 volt, A.C. power plants; plug in the proper end of the antennae; give time to the set to warm up, and watch a few dial-hands, no more than a score of them. As soon as some of these hands had moved and steadied to a certain point, and others begun to wag like the tail of a friendly pup, all was ready. Down went a switch and we spoke into the microphone for the world to hear. Up went the switch and voices would pour out of the loudspeaker. A twist of the dial to the right or the left—and hams from 48 states of America, multitudes of other hams from 48 other nations of the globe would be speaking to us.

"Listen," I said to Charlie. "Hams collect new stations like rare stamps. After all that Dorothy has done for us, we cannot cheat her from being the first to contact us."

I looked at the calendar. "I am going to cable Dorothy we will be on the air on the 25th at midnight, which means 7 P. M. in New York."

Charlie was positively enthusiastic. Except for a small detail. He had figured out exactly the direction in which the great V antennae should be stretched in order to be beamed as nearly as possible toward New York. This, of course, would add the perfect touch to our entrance into the universal brotherhood of hams. But—there was a but. Between the 200-foot legs of that V, there stood several antheaps as big as hills and thickly covered with trees. And the instruction book said there shouldn't be any obstacle

The elephants didn't relish the invasion of the hams either. The glade Gatti took over was their favorite eating place, its sturdy trees their pet scratching posts.



within 20 feet below the legs, which, in turn, would work best about 30 feet from the ground.

It seemed quite extravagant to go and move thousands of cubic feet of earth for such a purpose. But the Belgian in whose plantation we were camping said he was only too happy to see those gigantic antheaps go. He could even supply us with hundreds of native laborers—if we paid them, naturally. And Charlie said that, working hard, he could do it in ten days. So I went to town to cable Dorothy Hall.

True to his word, by the 25th Charlie had everything ready. True to her promise, by midnight of that day Dorothy got something like a thousand hams frantically fiddling their knobs and dials, in a world-wide competition to catch our signal first. We only learned about Dorothy's performance on the 29th, when a native from the post-office bicycled to our camp and delivered a cable from her. "No signal heard," it said, "either here or by hundreds hams who communicated with us. Have you forgotten schedule you made?"

Charlie is fixing the electric fence around the camp that was supposed to discourage inquisitive visitors. . . . Well, it was a good idea.

Forgotten the schedule? Why, for the last five days and nights Charlie and I had done nothing but cajole, coax, threaten and curse that beastly station of ours. We had changed and rechanged all the parts for which we had spares. We had knocked on each tube, blown breath through every hole, prodded every single one of the two million wires visible, moved the set around, sent boys up trees to move the legs of the antennae until their own legs were full of splinters. During those five days and nights, we had slept and eaten only when near collapse. We had called in that mike until we were blue on the face.

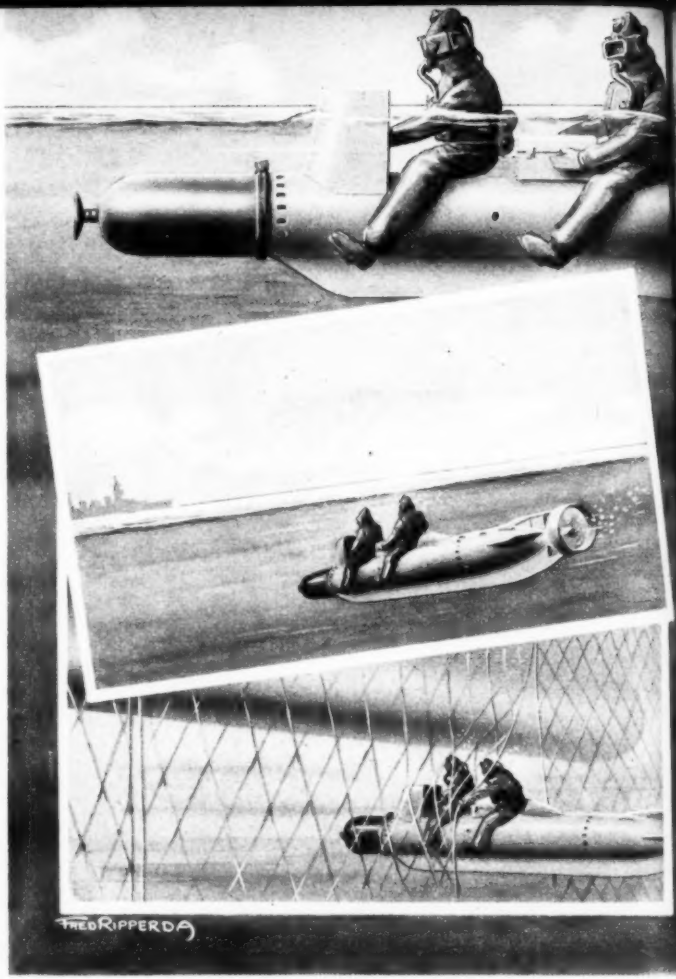
"Here is OQ5ZZ, the Tenth Gatti African Expedition in the Belgian Congo, calling America," one of us would say, while the other went through acrobatics around the switches, knobs, dials and plugs of the set. "Calling America! Here is OQ5ZZ calling W21XX. Hello. Hello. Blank—blankety—blanketed—blank. Blank. Here is the blankety son of the blank, OQ5ZZ, blank—blank—blank, calling America from the blank Belgian Congo. Hello. Hello, America! Come in, America!"

And the dial hands which should have moved to a certain point and steadied there could not be persuaded to show the slightest sign of life. And the others which should have remained dignifiedly immobile in a certain place, would shake and wigwag with shameless gall.

I went to see the District Commissioner. He was a huge Belgian whose stone-like face had always seemed anatomically unfit to crack a smile. That day, all his usual solemnity had vanished. He shook my hand with enough enthusiasm to smash a couple of bones. If there had been glasses in the windows they would have been shattered, too, the way he roared with laughter.

"I really must thank you," he said when he finally managed to regain some of his composure. "I thought I knew English well, but during the last few days I have learned more new curses and bad words from you and Charlie than any book could ever teach me."

I felt my face getting red. I said something about our transmitter not working, the "skip zone," the antennae [*Continued on page* 142]



TWO MEN ON

by Richard Hanser

Written in England especially for Mechanix Illustrated

LONDON—In January of 1943, events of crashing importance were riveting the attention of the world, and the tempo of the war was building toward a new crescendo: the RAF was pulverizing the Ruhr, the Russians were closing their fingers around the throat of the gasping Sixth German Army at Stalingrad, and Montgomery's boys were uncorking the power that was to knock Rommel's Korps right out of Africa.

These events were trumpeted aloud in the free press of the world. At the same time a drama took place at sea which was mentioned in no paper anywhere but which combined the two basic ingredients of this war—human courage and mechanical wizardry—in a way so spine-tingling and fantastic that it will doubtless be remembered and talked about long after greater events are relegated to the obscurity of the history books.

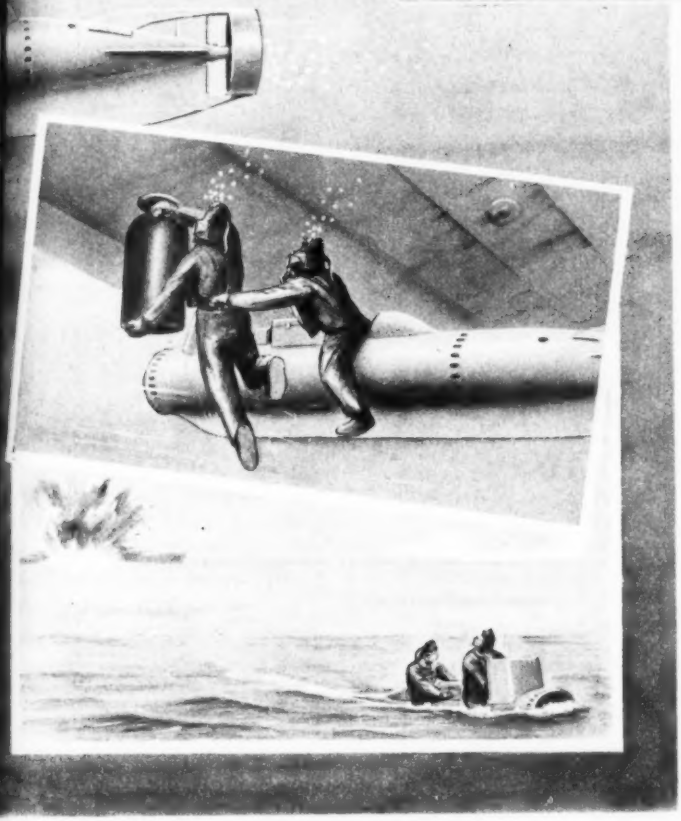
The cast of this drama was small. There were no masses of men and equipment hurling themselves against other masses of men and equipment; there were no swarms of four-engine bombers flying wing-to-wing against whole cities and areas. There were just six sailors in nightmarish costume, sitting astride live dynamite and chugging slowly, relentlessly through the Mediterranean toward a target hidden in total dark. . . .

The story that no newspaper could print at the time broke fifteen months later in the austere London Gazette, a court publication of piffling circulation, which announced that among others Temporary Lieutenant R. T. G. Greenland and Leading Signalman Alexander Ferrier, of the Royal Navy, had been decorated for their night's work in the Mediterranean more than a year before. "Conspicuous gallantry" was the phrase used by the Gazette, and that, to be sure, was putting it mildly.

These men were human torpedo crews, and what they did was officially, if somewhat skimpily, summed up in a Royal Navy statement which read as follows:

"Human torpedoes, manned by personnel of the Submarine Branch of the Royal Navy, have been used with conspicuous success during operations in enemy waters.

It's no snap jockeying torpedoes into hostile harbors. Nearing their target, the riders must submerge, then cut or dodge their way through submarine nets. Once the lethal war-head is attached the men get away fast.



A TORPEDO

Another MI first—an on-the-spot story about the tin-fish jockeys. They're the boys who submarine into enemy ports astride live dynamite.

"During a night attack, carried out in January, 1943, against the strongly-defended enemy base at Palermo, several human torpedoes negotiated a net defense and proceeded undetected across the whole length of the harbor.

"One craft, manned by Lieut. R. T. G. Greenland, R.N.V.R., and Ldg. Signalman A. Ferrier, attacked and sank the 5.3-inch Italian Regolo class cruiser Ulpio Traiano, which was completing for service.

"A second human torpedo, manned by Sub.-Lieut. R. G. Dove, R.N.V.R. and Actg. Ldg. Signalman J. Freel, attacked the transport Viminale, of 8,500 tons, which was lying alongside the jetty, and so severely damaged her aft that she had to be towed away for repairs. During this passage she was sunk.

"Human torpedoes are of approximately the same size and shape as ordinary torpedoes. They are driven by electric batteries and are manned by a crew of two, who wear diving suits and sit astride the body of the torpedo.

"A charge, similar to the warhead of the torpedo, is attached to the nose.

"These craft are maneuvered at slow speed toward their targets, and dive under them. The charges are then detached from the main body and fixed to the bottom of the enemy ships.

"Time fuses are set, and the human torpedoes, now minus their warheads, are driven away to be clear of the target area before the charges detonate.

"The crews of the two human torpedoes responsible for the successful attacks on the Ulpio Traiano and the Viminale reached the shore in safety and were made prisoners-of-war, together with Pety. Offr. John Malcom Miln and Able Seaman Harold Victor Worthy, members of the crew of other human torpedoes which took part in the operations."

The statement of the Admiralty that the human torpedoes are of about the same size and shape as the usual kind indicates that they

But men working in rubber diving suits, prison camp, which is what happened to the

The commanding officer of a "human torpedo," the driver, sits at the controls, with a pillion rider behind him. Until the target's near they ride the surface.

are 18 feet long and 21 inches in diameter. They carry up to 500 pounds of high explosives. Built into the torpedo are seats for two men, the driver who sits in front and the pillion rider. They sit astride their dynamite bronco like horseback riders.

Over layers of woollen clothing, the two-man crew wears light diving suits, fitted with oxygen-breathing apparatus which is probably a modified form of the Davis Submarine Escape mask which was developed before the war for the safety of submarine crews. There is the same type of breathing-bag strapped to the chest, but in this case a complete face piece, with a hinged visor, is provided instead of the goggles, mouthpiece and nose-clip in the usual Davis apparatus. The hands of the crew members are bare.

The commanding officer of a human torpedo, the driver, has in front of him a steel shield to take some of the water pressure off his body as the torpedo travels slowly toward its target. Even so, the pressure and strain is certain to be considerable. Inside the shield are the controls and the instrument panel.

In both instances mentioned in the Admiralty communique, the pillion riders were signalmen, which has led experts to speculate that the torpedo is furnished with equipment enabling the crews to keep in communication with a depot ship, and possibly with each other.

The speed and the range of the human torpedo are not disclosed, but neither can be very great, a circumstance which doubtless adds to the terrific strain on the nerves and stamina of the crew. The speed is probably only a few knots, because of the water pressure on the crew and the danger of a wash which could easily betray the torpedo's approach to the enemy.

The torpedo is evidently launched from a parent ship or submarine which approaches enemy coasts, harbors or fortifications under cover of darkness. It is likely that the range of the human torpedo is too restricted to permit it to return to the parent ship after its work is done. The result of this is that every human torpedo crew that goes out faces two, and only two, alternatives: death or captivity. There is no third possibility.

Perhaps the most gruelling and grinding job of the human torpedo crews was working their way through the nets defending the harbor. The usual steel harbor net hangs like a curtain from buoys on the surface and reaches to the bed of the harbor. It is possible that there may be gaps between the edge of the net and the sides of the channel across which the net is hung, but this cannot be counted upon and, at any rate, there is no assurance that the gap will be big enough to admit the torpedo even if it's there.

To make a try at cutting the nets is literally to toy with sudden death, because explosive charges which detonate electrically are fixed at irregular intervals along the nets. The circuit setting off the charges is instantly closed by any metal, like the nose of a submarine, coming into contact with the net.

But men working in rubber diving suits, and perhaps supplied with especially designed tools, could work it this way: the human torpedo is driven close to the net and then submerged to the bottom; one of the men dismounts and, with some sort of grapnel, hauls up the bottom of the net, while his partner drives the torpedo through to the other side. The net-holder then crawls through himself, re-mounts the torpedo which proceeds on its way. This, of course, must be done at the bottom of the harbor (60 feet at Palermo) in inky blackness and utter silence —for fear of sound detecting devices—and in constant peril of instant annihilation.

But even when the crew has negotiated the nets, the situation is far from rosy, and there remains plenty of wracking work to be done. The worst, in fact, is still to come. The human torpedo finds its way to the ship that has been marked for destruction, and draws alongside, probably under the stern. Once more the torpedo is submerged, and the business of attaching the torpedo's warhead to the side of the ship begins. This, too, is done under water.

The pillion rider dismounts and performs the intricate technical task of making the explosive charge—the "sticky bomb"—adhere to the side of the ship, and of setting the time fuse properly so that he and his companion will have some semblance of a chance of escaping the effects of their own dynamite. When everything is in order, the pillion re-mounts once more and the human torpedo, now free of its warhead, turns around to get as far away as possible before the explosion. If it is still in the vicinity of the enemy ship when the charge goes off the crew of the torpedo is literally hoist by its own petard. If the crew members were totally submerged at the time of the explosion, they could be killed at more than half a mile through lung collapse. Assuming they are extremely lucky and get away unscathed, they then face the grim and uninviting prospect of an enemy prison camp, which is what happened to the men mentioned in the Admiralty announcement.

Who were these men who undertook, and carried out successfully, an adventure that Captain Marvel might hesitate to attempt? They were all volunteers, to begin with, and they were all subjected to the most exacting training and testing to qualify them for the bodily, mental and nervous ordeal they were destined to undergo.

Richard Greenland, for example, used to belong to a band of young dare-devils who called themselves the "River Rats" and loved nothing better than to sail their 14-ton yacht Henriette from Ipswich down the River Orwell, across the North Sea to Holland and back. They were all in their teens or early twenties and "messing around with boats" was their idea of life at its best. In January of 1940 all fifteen of the "River Rats" joined the Navy together as ordinary seamen.

Most of them, [*Continued on page* 152]

Torpedo riders wear light diving suits over layers of woolen clothing and use visor-type oxygen masks for breathing.

CONTINENT OF TOMORROW

Tiny Uruguay has the 3rd largest city on the South American continent—Montevideo, the capital. Once there, you'll hate to leave the easy-going life at the mouth of the Plata River.

YOU can get anything and everything you are looking for, *somewhere* in South America. That continent contains such an infinite variety of treasure. While there is treasure without end down there in that neck of the hemisphere, you are not going to find it lying around in neat piles or growing on trees ready to fall into your hat. Your job in attempting to take possession of it is going to be on a par with that of all other treasure hunters since the world began. Early American pioneers and Klondike gold-seekers alike went up against it. Trouble, risk and peril barred the way. It took guts and stamina then, and it will take the same sort of "makings" to bring home the bacon tomorrow. The point we are trying to make is that the bacon is there. In the majority of cases, deadly jungles, impenetrable forests, searing deserts, uninviting wilderness, freezing mountain tops or savage aborigines usually stand in the way. And that has always been the way of the treasure hunt, hasn't it?

Now comes Uruguay, a country with seemingly none of these perils to endure. By the same token, don't go down there expecting to find an abundance of all the more precious natural resources. They simply aren't there. No gold, no silver, no precious stones. But don't let that dismay you. Big and positive opportunities are to be found by the settler in Uruguay, nonetheless.

Uruguay is a personable little son-of-a-gun of a nation. It is the biggest little country in all South America. The whole shooting-match is only a couple of times as large as the State of New York, or about as big as Missouri and Connecticut put together. This pint-sized land would only make a nibble for Argentina that bounds it on the south,

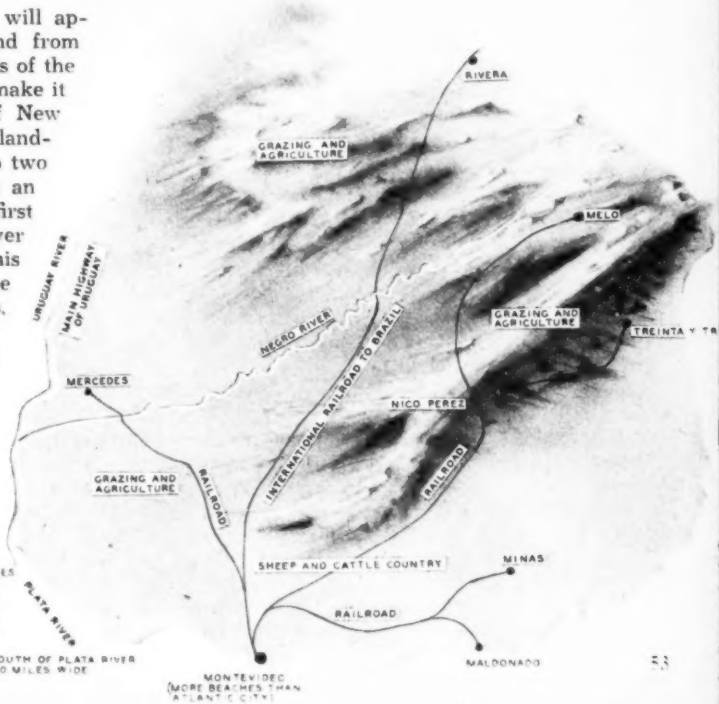
NO. 9: URUGUAY

by Henry Albert Phillips

Ninth in a series of articles taking you country by country through South America.

and just a bite for huge lumbering Brazil that bears down on it from the north. You could fly over the whole of Uruguay in a few hours' time. From your airplane the land would resemble a lop-sided green leaf lying on the edge of the continent with a score of rivers like veins flowing through it in curlycues. Plenty of water everywhere: the Atlantic Ocean on the east, and the wide rivers Plate and Uruguay forming its other boundaries. The entire surface of the leaf is green; an undulating plain from rivers to ocean, with the highest elevation no more than 2,000 feet above sea level. There is scarcely any waste land, or an acre that is sterile or not good for something. The whole area is as clean as the palm of your hand, except for an occasional patch of scrub or a grove of timber here and there. So, you get cleared land with your title; no forests to cut down, no stumps to pull, and no brush to clear away and burn. Nature has done the job as though on order. That makes pioneering almost a laughing matter. But it has its drawbacks, as you will learn in time.

In all probability, you will approach this promised land from the sea. The fast steamers of the Moore-McCormack Line make it in about 11 days out of New York. A few hours before landing you will be treated to two sights that will give you an unforgettable kick. The first will be the sight of a river mouth 180 miles wide. This is the River Plate, also the gateway to Buenos Aires, Argentina. Uruguay occupies the right-hand corner that juts out on the sea. Sight number two will make you rub your eyes and make you wonder if you are not looking at a shrunken edition of



The infinitely fertile little giant to our south. No jungle, no gold, but wealth awaiting.

The Uruguayan gaucho is haughty and daring, no storied shepherd. The farmer is peaceful.

Manhattan Island with its tesselated backbone of glistening white skyscrapers. You are looking at the capital city of Montevideo, the third largest city in South America, with a population of more than a million. Incidentally, you are looking at the homes of more than half the people of Uruguay!

When you come to whirl in a taxi through several square miles of one of the neatest, most efficient and perfect dockyards, customs and bonded warehouse districts in the world, and find yourself on Main Street, that is like another Broadway canyon boring its way through slightly diminutive skyscrapers, you will discover that the city that stretches so magnificently for several miles along the sea front is something of a shell. It is only a few blocks deep. For all that, it has everything that any great metropolis can boast of. The $5-a-day hotel is more beautiful than the Stevens House and only a fleabite compared to the Waldorf-Astoria, but you get all that a first-class hotel can give, in a European manner.

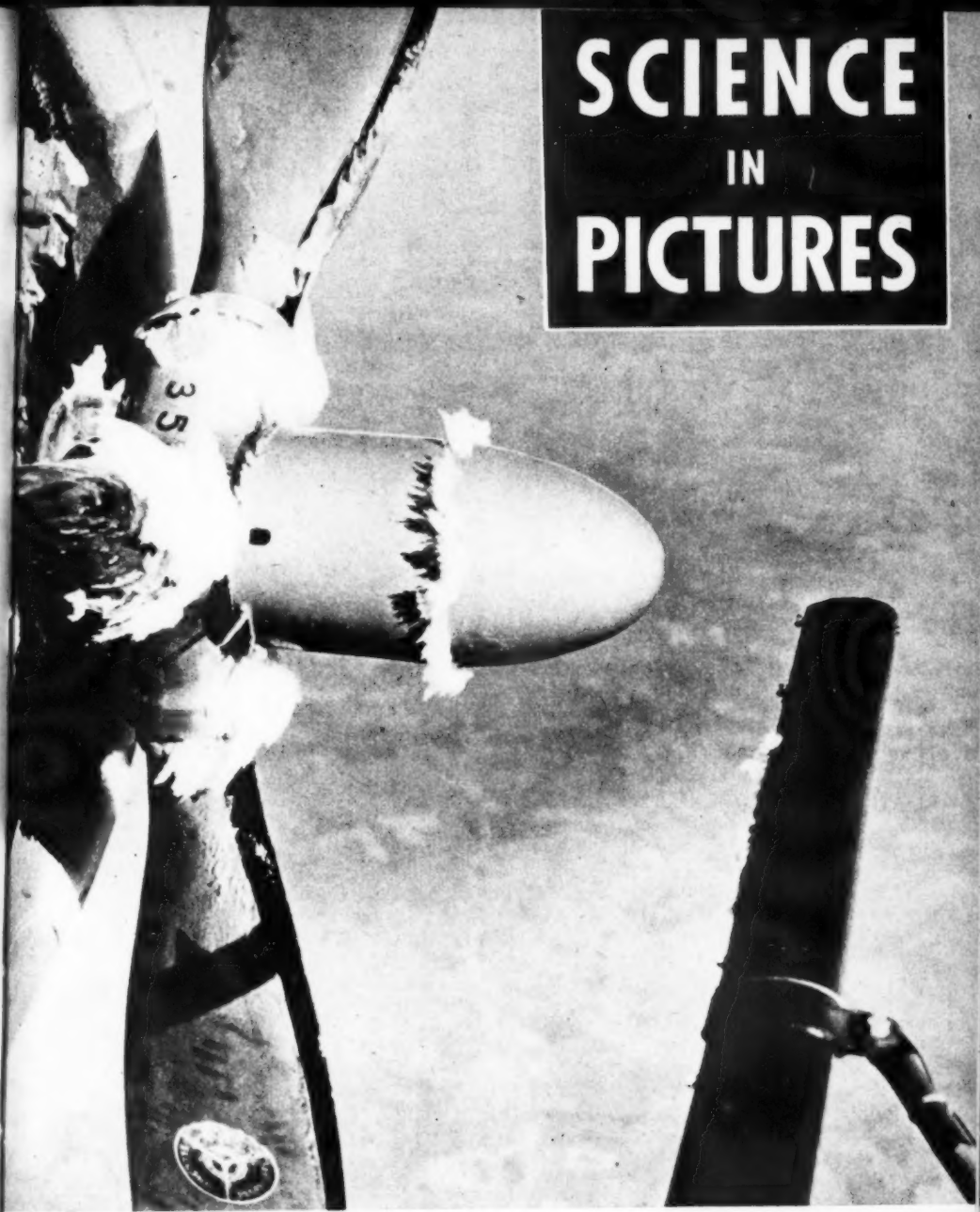
Within the next day or so of looking about, you will discover that Montevideo is a blue ribbon town. It holds a record for more "firsts" than any other city in South America. It has a stadium with a seating capacity of 80,000. The 15-story hospital is without an equal. The National Bank of Uruguay occupies the biggest bank building in the world. But the real "tops" of Montevideo—that puts Atlantic City or England's Brighton in the shade—is a continuous stretch of seaside resorts—bathing beaches, hotels, promenades, seaside drives and boulevards, that stretch out from the heart of the city, for 20 miles.

On the shore side of the city one of the finest bays you ever saw bulges out from the river. It's a costly luxury, however, because it is estimated that it costs 30 million dollars every hundred years to drain it. This gives them an enormous inner harbor to play with; one for the river and the other for sea traffic. It's only a five-hour step up the Plate to Buenos Aires.

That's your city of big chance, if your talent, experience and training lie among urban pursuits. Of course, you will go out from this cleanest and healthiest city on the continent and have a look over the whole country before making your decision. But you'll be back in Montevideo before long; either to take up an occupation there, or just for a good-time holiday which is one of the best things they sell.

As has been stated, more than half the population of Uruguay lives and disports itself in the more-than-a-million city of Montevideo. Once you [*Continued on page* 148]

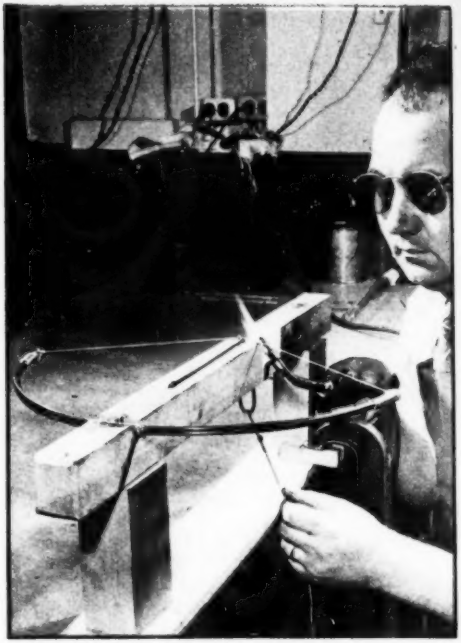
SCIENCE IN PICTURES



WAR AGAINST ICE. A propeller power unit cover wears the crown of one of aviation's worst enemies: ice. At a Flight Test Unit of Curtiss-Wright Corp. an outrigger sprays water on a medium bomber's propeller at 20,000 ft. Then various de-icing solutions are sprayed over the same surfaces and their effects recorded for study in the ground laboratory. Weather variations are simulated by changes in outrigger's nozzles.

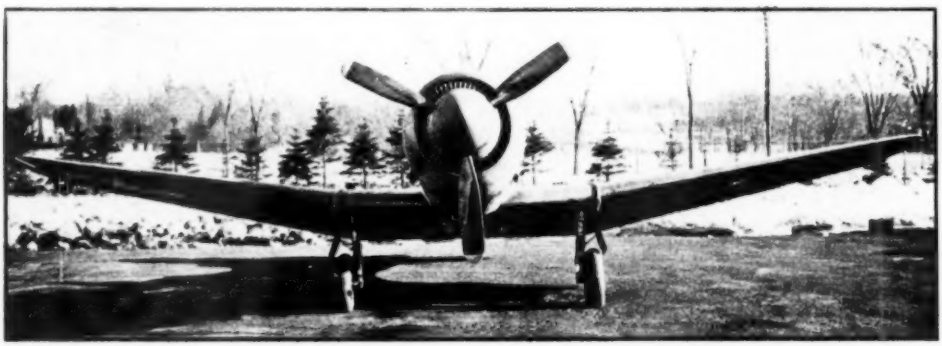
Self-Heating Soup

HOW about some hot ox tail soup in your fox hole? Just light a cigarette and ignite the fuse on the top of the can. Underneath is a small tube built into the center of the can that contains the heating element. The fuse smokes until it burns to the level of the heating element. Keep it in mind—all itinerant bachelors.



Science Robs The Past

HERE'S an adaptation of the medieval cross-bow. This Westinghouse doctor sets bow in firing position, attaches arrow to piece of quartz, heats quartz until almost molten, pulls trigger. Quartz filamets. 1/30,000 of an in. in diameter, are shot out. These are used as measuring sticks for magnifying power of the electron microscope.

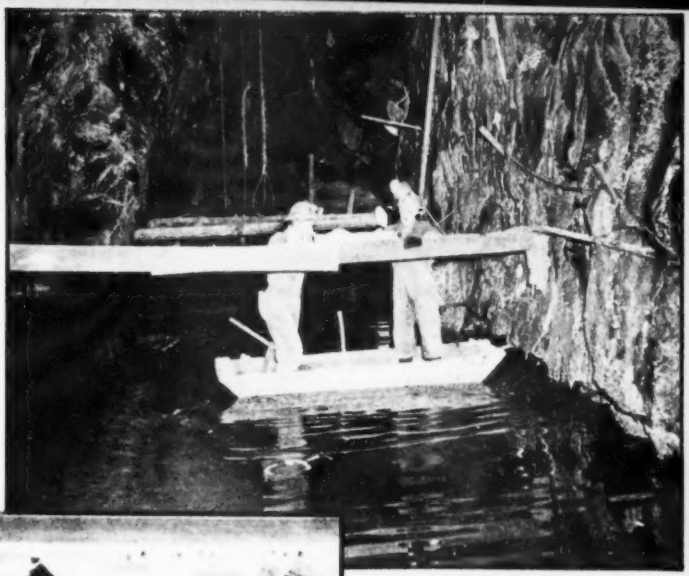


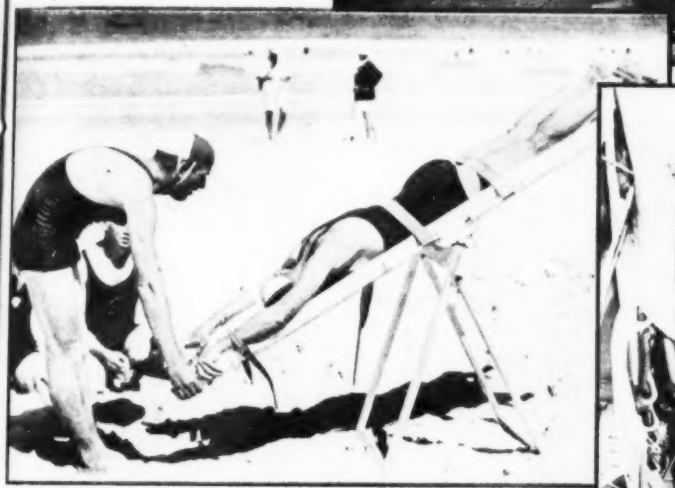
Fanning The Flying Fighters

WITHIN the engine cowling of this dive bomber is a new multibladed fan. It gives faster rate of climb, higher cruising speed, largely eliminates speed cooling drag of older methods of cowling. Now air at high pressure goes over engine cooling fins.

And None For Table Use

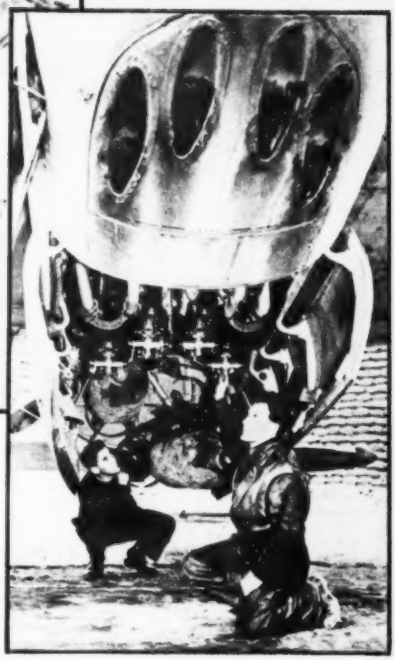
NORTH America's largest mineral salt deposit, biggest in the British Commonwealth, is in Nova Scotia, Canada. It's not exactly new, being 27,000,000 years old. Salt miners leave great caves, lakes and even underground mountains as they cut into it. Snow-white and 98.5 per cent pure, its war uses are for high-test gas, synthetic rubber, vitamin capsules, munitions, etc.





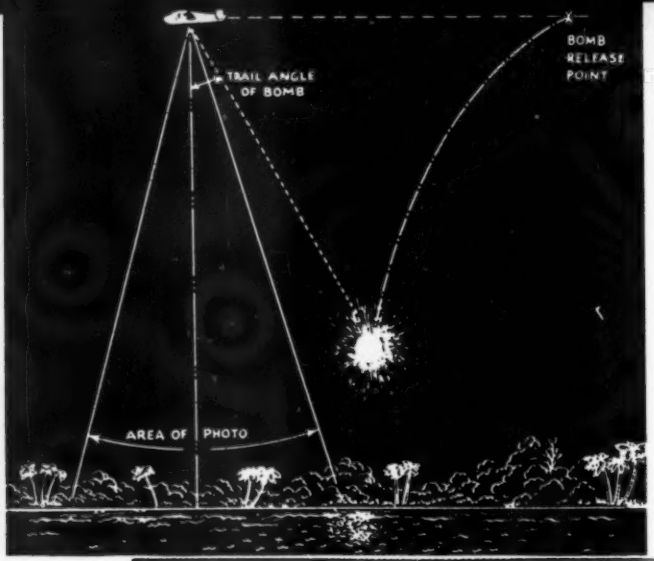
See-Saw Life Saver

WHEN undertow or fatigue or panic defeat a swimmer, the Australians have a simple "Eve Rocking" device for resuscitation of the victim. A lightweight stretcher is mounted on a collapsible saw-horse after victim is securely strapped.



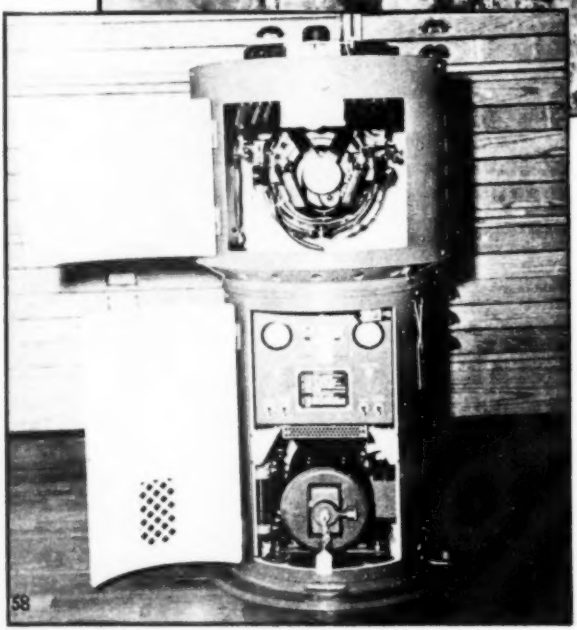
The Guts Of A Mosquito

THE hit-and-run speedster of the RAF, the spectacular Mosquito, gets snapped with its bay open. Two 500 lb. bombs are being set in place by the rigger in rear. In front, the armorer checks the mechanism of one of the four 20 mm. cannon whose muzzles are in the recesses above. The fighter-bomber also totes four .303-cal. machine guns.



To Snap 'Em From The Air At Night

THE A.A.F. has a bomb for night photography. It creates a huge burst of light behind area to be snapped. As flash powder in bomb ignites, it actuates a photo-electric cell which works the camera shutter in the plane. Below, a photo-bomb flash as it looks from 10,000 ft. The flash will not show up in the picture except if reflected from some water area. In this case a special Liberator had a KI9a camera with 12-in. lens. Exposure—1/25 sec.—diaphram stop f2.5.



Invasion Gyrocompass

THE brand new gyrocompass being used by landing craft, the Sperry Mark XVIII, is the Navy's latest navigational device for invasion. Only 19-in. in diameter and of standard height, it's just the ticket for the "little ships." Top section is compass itself—bottom holds motor generator, control and amplification panels. With the doors open the three main units are visible. No rough sea, nothing but a shell or bomb hit knocks 'em off course now.

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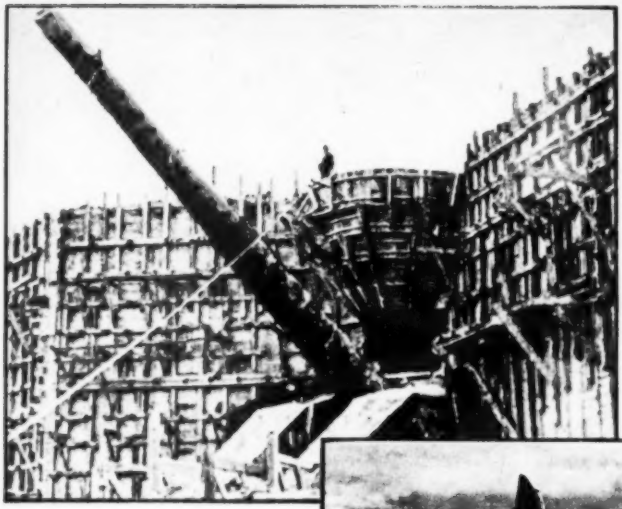
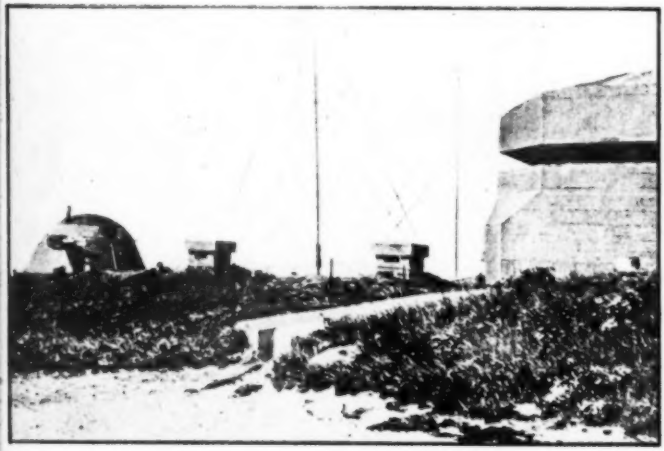


A Giant Against Our Sea Power

SOMEWHERE on the Nazi side of the Channel this huge gun stands or stood guard against an invasion by water. Stood is said because of the intense pounding given that coast by allied bombers. There is no doubt about this gun emplacement being a formidable shelter, but neither is there any doubt about that aerial pounding.

And A Devil Against Their Ships

NO GUESSWORK here! This is Britain's Fairey Barracuda, a combination dive and torpedo bomber, a killer with the fleet air arm. The German battleship Tirpitz knows. Barracudas darn near sent her down at her hideout in Alten Fjord recently. They left her battered and burning, her fire-control busted up.



Let's Look At It More Closely

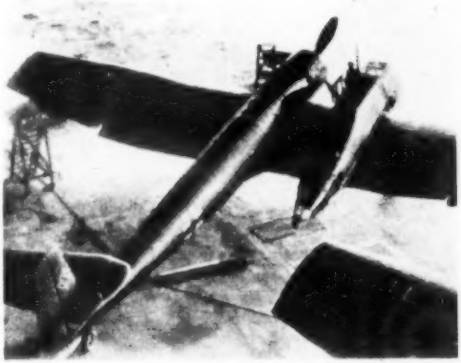
THAT French Coast again. Gun emplacements and observation posts and a trick radio aerial. Fritz says the whole works are connected by subterranean tunnels, bombproofed. But when the Allied fleet sits offshore and opens up with its big guns, we'll find out how strong they are. Remember Kwajalein, Nazi? And no paratroopers were used there!

Sounding Out Raid Victims

RADIOED from Sweden, this picture shows a German Air Raid Police Patrol searching for raid victims in wrecked buildings with the aid of a sensitive device that picks up and amplifies the slightest sound from the ruins.

Off Again, On Again

THE Germans have talked of this asymmetrical plane, the Blohm and Voss-141, for some time, now allege it is in mass production. Odd design permits the crew to concentrate in nose for photo reconnaissance.



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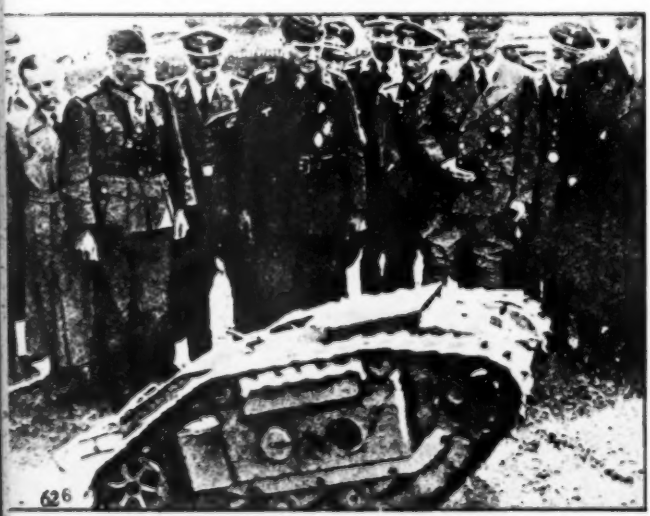
Booming Timber Down

PLACE a small charge of TNT on the trunk of a tree and you'll blow away some of the bark. Place an equal amount of RDX in the same way and what happens is shown at left. So powerful is the new explosive that transporting it is a major problem. Usually protective lead cases are used. Note here how neat the cut is, despite the shredding of the trunk.

Army's Yo-Yo

FIRST photo released of the Army Air Forces new YO-60 autogiro. Kellet Aircraft Corp. has turned out a service test lot of them to be operated for tactical studies and instructional work. A Jacobs 300-hp. engine powers them. The introduction of flaps on airplanes has somewhat lessened the autogero's popularity, but it's still useful.

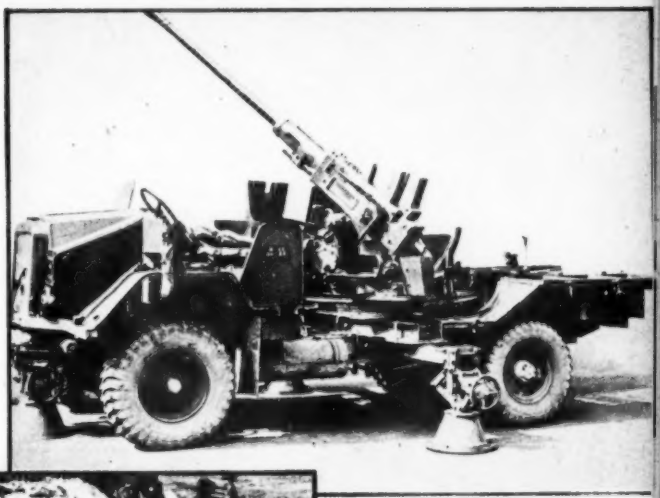


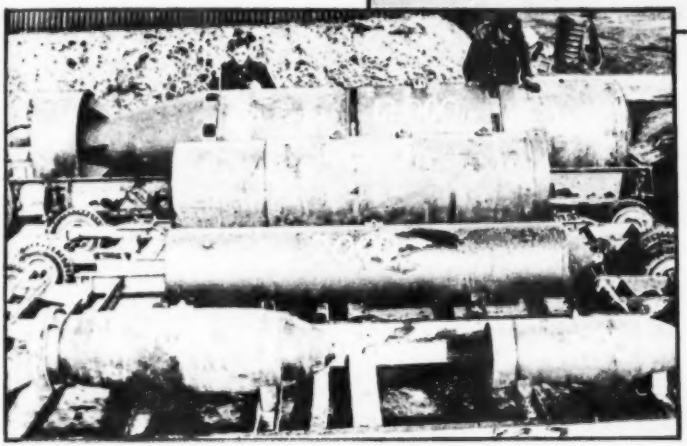
Jap Beetles Are A Worse Pest

ANOTHER of Hitler's "retreat weapons" was sprung (hopefully propelled) against our boys in Italy. It's a six foot tank controlled either by radio or electric cable, carries 1,000 lbs. of explosives. These crawling babies have been nicknamed "beetles." Here, a group of German officers looked mighty pleased about the infant; but the boys on the Anzio Beachhead blew hell out of them upon sight.

The "Flower" Gun Made Mobile

BRITAIN'S famous Bofors ack-ack gun, that pumper of black sky flowers, has been mounted on a Morris chassis to get it around at speeds up to 40 m.p.h. The invading airplane's mighty enemy fires a 2-lb. shell 9,000 ft. into the air at the rate of 120 rounds a minute. Note the sturdy construction of the gun carrier and the anti-recoil anchor jacks.



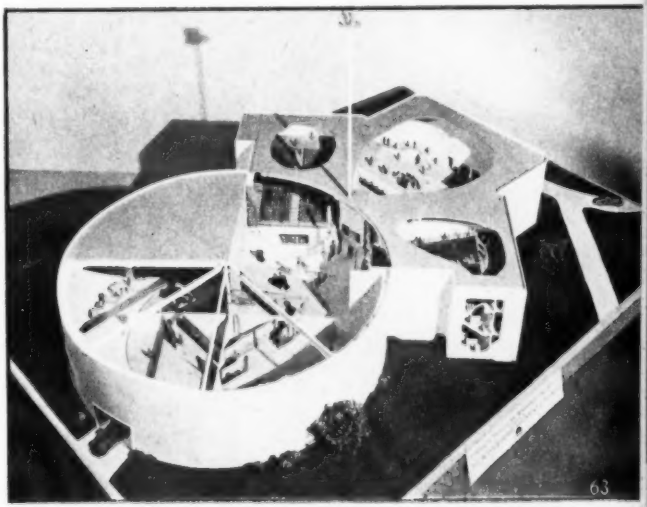


Here's The Latest Greatest One

WHEN the 2,000 lb. blockbuster fell on industrial targets in Germany and occupied France, the air minded world whistled aplenty. Then came the barrel-like 4,000 lb. factory blaster. Now RAF bombers release 12,000 lb. monsters, finned and tapered, which dwarf the earlier British heavies.

See It Now—Same Time, Same Station

HERE'S the television studio with perfect design and practical broadcast staging. The Austin Co. exhibited this working model recently in New York. Layout consists of two large audience seating areas, each overlooking the same quadrant of a revolving stage in the building's rotunda. Rapid scene changes are thus achieved without interfering with the broadcast.



Main Stem Pin-Up

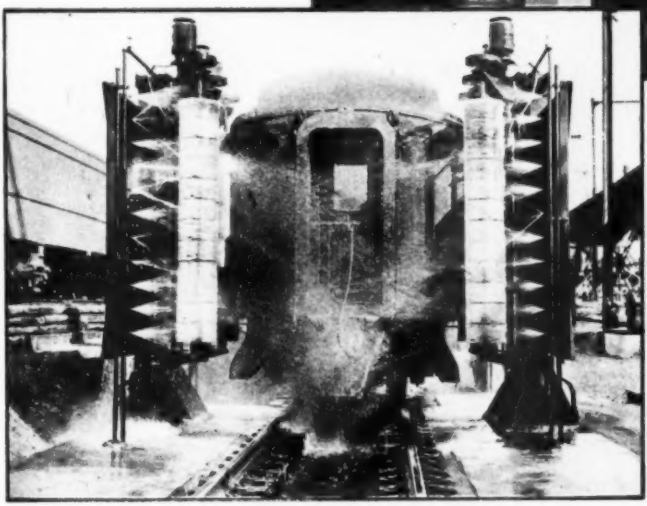
ONLY the keeper of the Pillars of Hercules could take this gal on a Mexican Hayride. The big, beautiful blond that advertises the Broadway show of that name is about a block long. The work of artist Varga, her lips (left) are longer than an archery bow, the face measures 16 ft. from chin up.

Havoc Near Heaven

THEY'VE been adding to the firepower of medium fighter-bombers, Marauders, Mitchells, Mosquitoes. Now the Douglas A-20 Havoc has a new power turret with twin .50's. That gives it nine .50's, six in nose, two in turret, one (rearward firing) in belly.

Jeep In A Box

TO YOUR right is a panoramic brief of transportation from 2,000 B.C. to the second you set eyes on this. That Egyptian ox cart (left) lugged material and people around near the shadows of the pyramids. Around 1900, country lanes were dust-clouded by this terrific vehicle on the right. And now (center) a jeep is glass-boxed for our curious civilians.



End Of The Long Handle Brush

IT COSTS $100,000 but it washes the exteriors of 200 Pennsylvania Railroad cars a day. A battalion of brush and hose men used to clean up around 15 a day. The cars move at four m.p.h. between two sets of revolving brushes while fine streams of water are played inward. Can't clean inside, though.

Farmer's Panzer Division

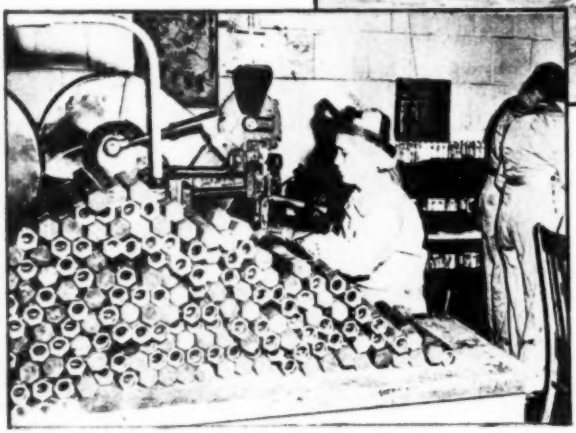
THE folks back home get hep. Sure, they're short of machines and men, but they've learned about modern warfare. The Massey-Harris Co., makers of self-propelled combines, is putting a plan into operation whereby combines are shipped to custom harvesters as crops mature. Each machine should harvest 2,000 acres, from Texas flat fields to wheat in the north.

The 20th Century Centaur

THE mythical Centaurs, half man and half horse, do have a sort of counterpart in modern form in the new British Centaur tank. Dubbed the mystery tank for a long time now, a few facts have been released about it. Of course, it's half man and half iron horse, but it's a fast cruiser tank that packs the kick of a six-pound gun. The armor is obviously heavy and the three-man turret certainly isn't vulnerable from the front or sides.

Like A Blizzard From Hell

TWO Jap bombers and a fighter will be sizzling soon as USAAF white phosphorous bombs burst over an airfield at Rabaul, New Britain. These 100-lb. bombs are deadly in effect against anti-aircraft positions and parked planes. Upon impact they burst and shower burning phosphorous over a big area. The Chemical Corps has stepped up production.

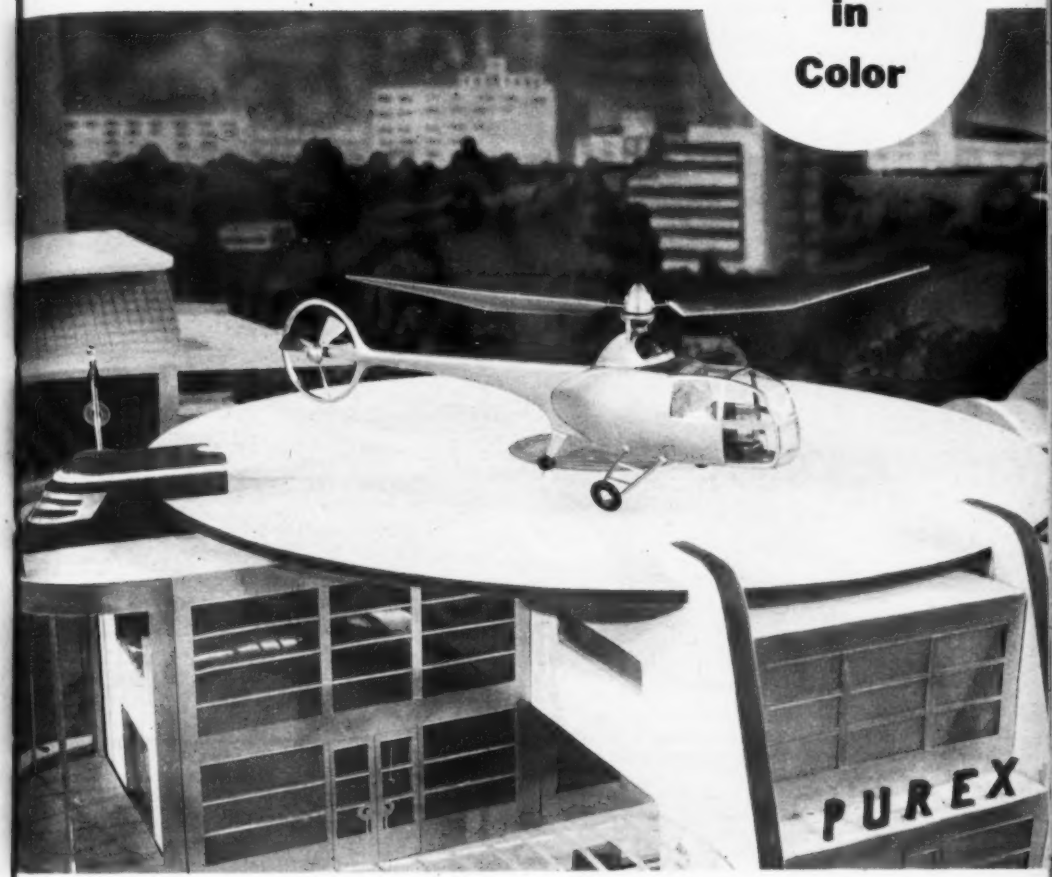


And The Smaller Magnesium Variety

HERE two to four pound incendiary magnesium bombs are having their vents corked. Bombers can carry as many as 1500 at a time. They are released in clusters, fall individually, and are devastatingly destructive.

Helicopter Fly-In

Science in Color

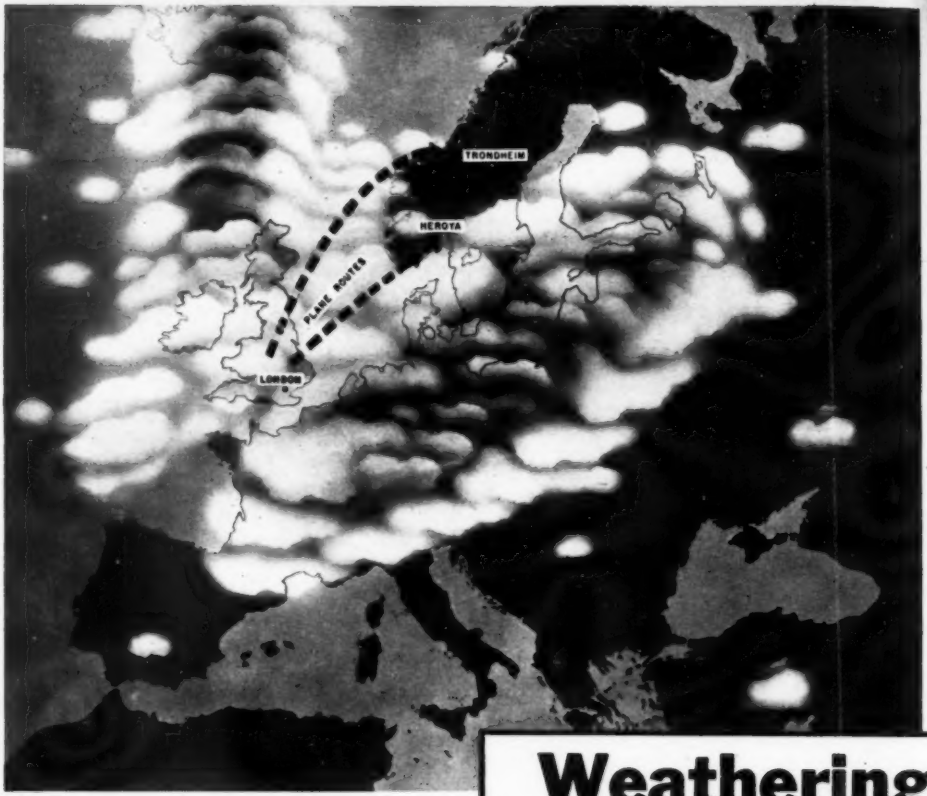


IF PRESENT plans being made by bus lines and aviation manufacturers for the post-war civilian helicopter work out, you may, one day soon, find yourself coming straight down to gas up.

Such a scene is depicted above in a colorful model of a proposed helicopter "fly-in" designed by the well-known firm of industrial designers, Martial & Scull. This super service station of the future accommodates both automobiles and helicopters, contains modern rest rooms, cocktail lounge and restaurant for relaxation and refreshment of air and land travelers. Simple, clean-cut beauty of design combined with a highly functional arrangement distinguishes the fly-in from its pre-war ancestors, which too often were an eyesore and blot on the American landscape.

New construction materials, both metal and plastic, and the scientific use of color (now being widely applied in industrial plants) do their share in this direction; they also help to make the fly-in easily spotted from above.

A large, circular flat roof provides ample landing space for the privately owned or taxi type helicopter, with a visual and electronic warning system notifying incoming machines whether or not the roof is occupied. Repair shops below are equipped to handle on-the-spot jobs as well as more complicated work on either cars or helicopters. Because of its compact layout, the fly-in station can be located in the heart of a city without using any more space than a gas station of today.



Weathering

Weather chart of a tricky bombing mission for July 24, 1943. Storm clouds protected our armadas all the way.

by Bernard Wolfe

Weather has become a weapon. Today long-range forecasts are calling the signals for the big pushes we plan.

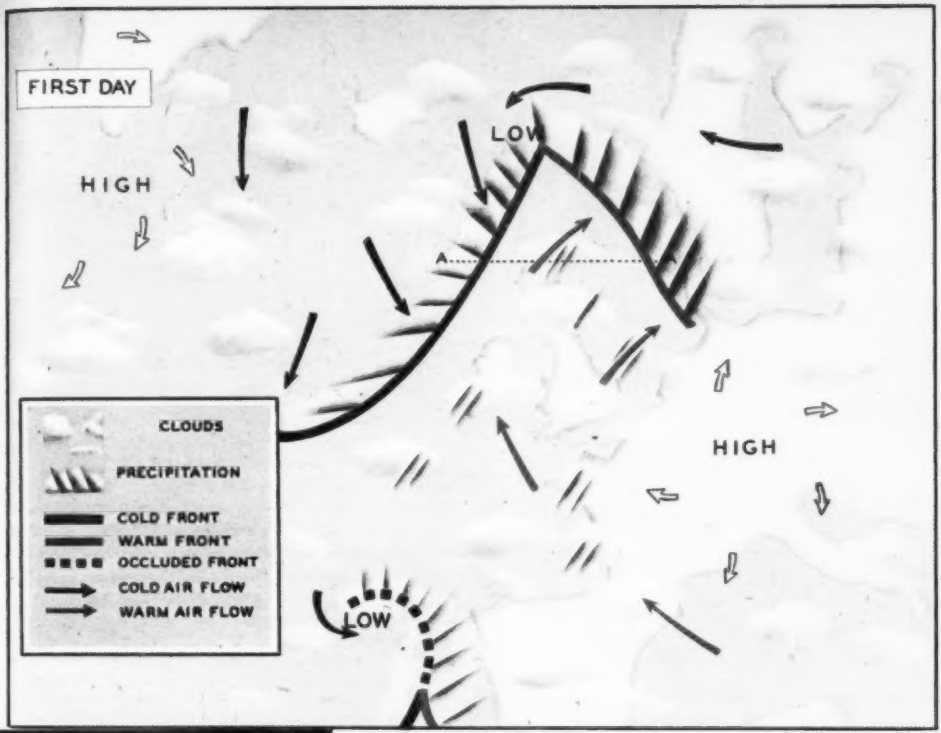
OUR bombers were handed a ticklish mission on July 24, 1943: to knock hell out of Trondheim and Heroya, two key points in German-held Norway.

Aerial armadas soared out of England into weather thick enough to slice with a carving knife. Britain that day, characteristically, was shrouded in a messy overcast of clouds. And ceiling remained zero all along the over-water route.

The sky was pea-soup, the mission duck-soup.

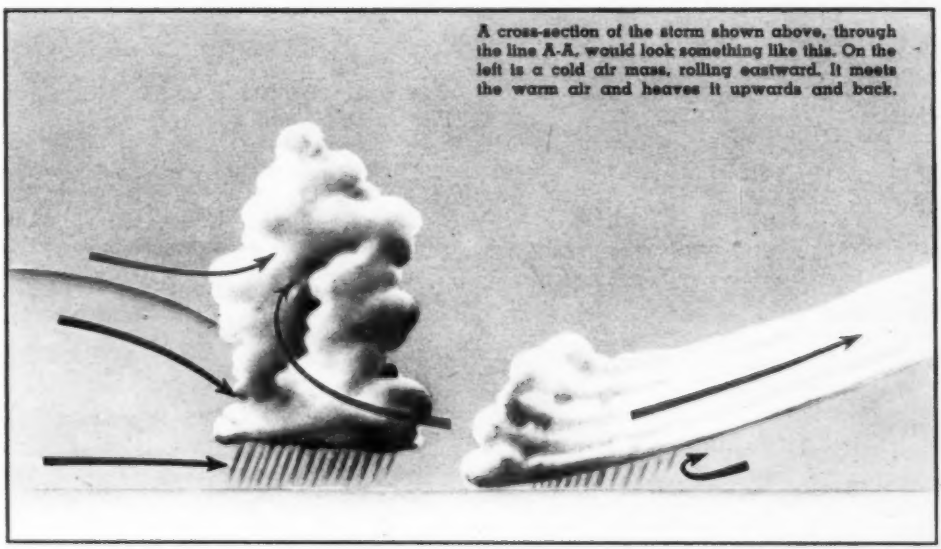
When the bombing squadrons reached their targets the thick veil of mist, cloud and rain was suddenly torn aside. Far below, the neat checkerboard patterns of those two Norwegian towns sprang into view as clearly as on an aerial photo. Blockbusters and sticks of incendiaries were dropped as per plan, right smack on the selected targets. Then the fleets wheeled and scurried for cover. All the way home they were blanketed in cloud and fog again. Enemy fighters wouldn't have had a chance in that stuff—the Luftwaffe hasn't yet developed any tactics for playing blind man's buff. The elements called the signals that day.

Was that protective storm-sheath just a lucky break? Far from it. The pilots of those bombers *knew* exactly what to expect—blind flying all the way, both coming and going, with convenient rifts in the cloud formations directly over their targets and nowhere else. They knew because the Air Forces weather man had told them. And *he* knew—10, 20, perhaps even 30 days in advance—because the war has brought on a revolution in meteorology.

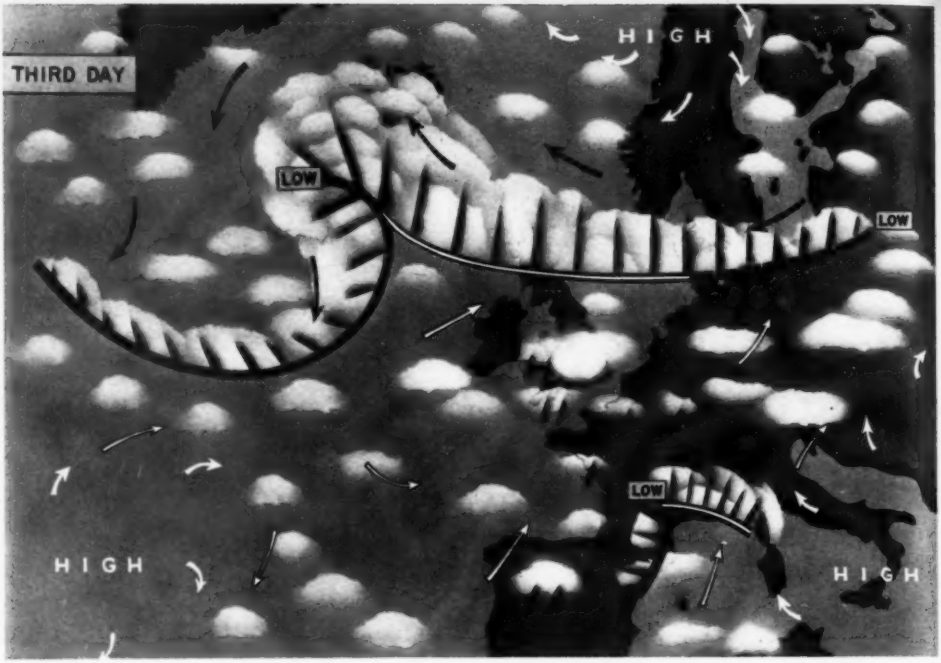


the War

Under the supervision of talented Master Sergeant Ralston Crawford, well-known artist, the AAF's Visual Presentation Unit has devised striking methods of charting the weather. Here's an adaptation of one of Crawford's maps, showing the first day of a storm sweeping in over Europe from the Atlantic.

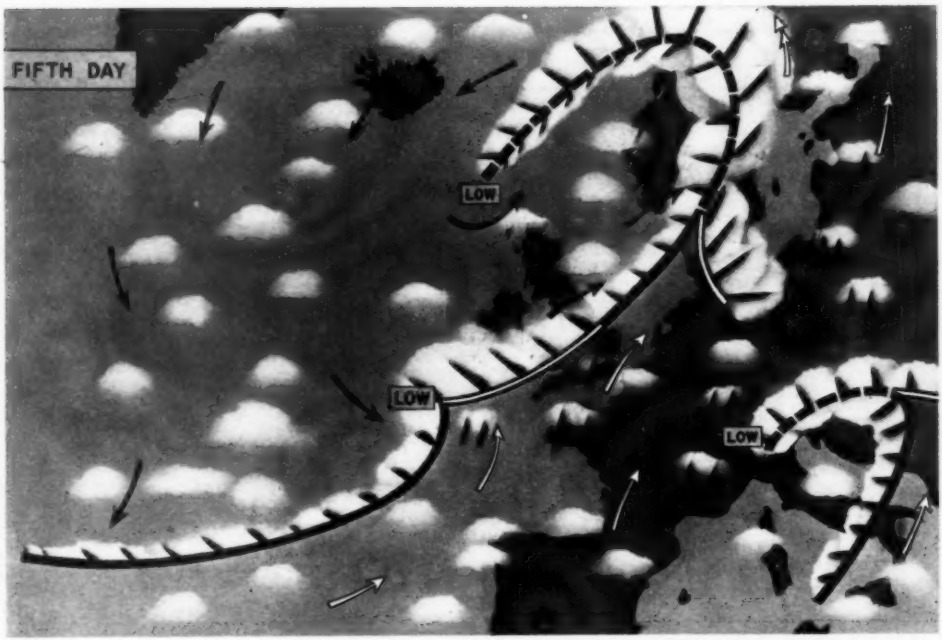


A cross-section of the storm shown above, through the line A-A, would look something like this. On the left is a cold air mass, rolling eastward. It meets the warm air and heaves it upwards and back.



Above, Sergeant Crawford's chart of the storm pictured on previous page, now in its third day. The cold air front has begun to double back on itself, but the warm air front, under the impact of the collision, has been stretched to the east. These movements make weather.

Below, the same storm on its fifth day. The cold air front has been pulled almost straight, while the warm front now curves up over England, Norway and Sweden. Note how their meeting point shifts its position. It is these shifts that give the weather man his clues.



Today, says General "Hap" Arnold, long-range weather forecasting is possible "with sufficient accuracy to permit of making preparatory plans for future operations." Weather has become a weapon, and our air strategists have developed the cunning to use it.

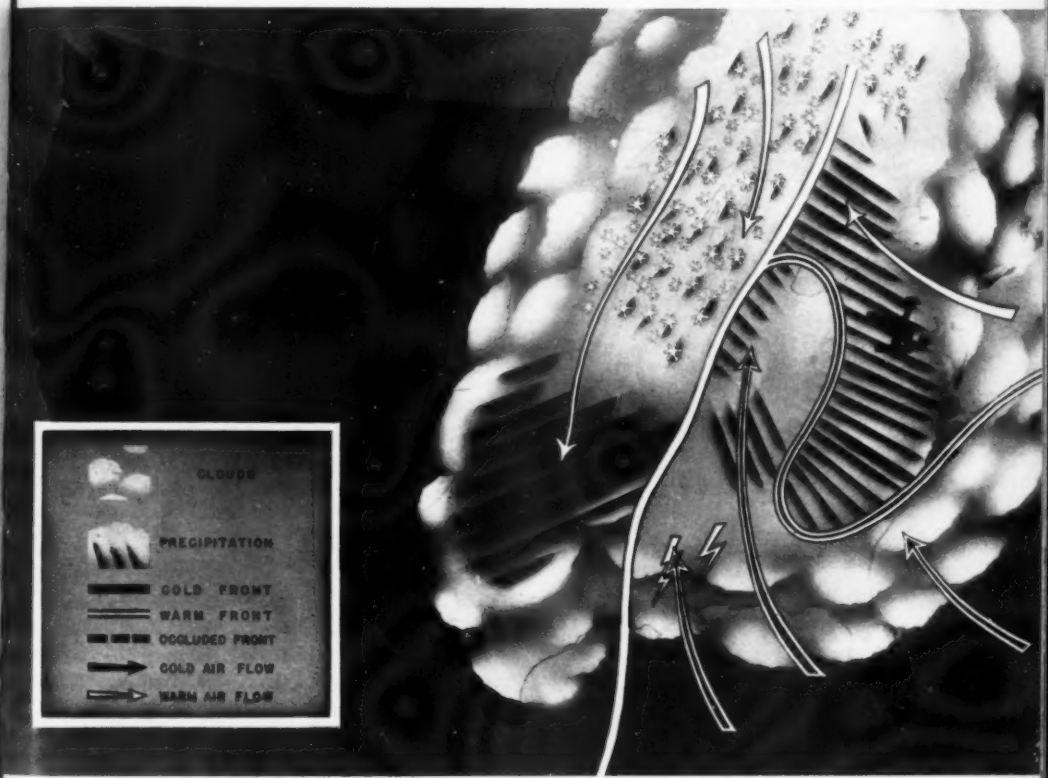
No Air Forces flight is plotted without a confab with the weather man. For example, strategy recently dictated a cross-channel mission to batter Rouen, France. The whole area was swept by storms, but the AAF weather wizard consulted his charts and discovered that a cold front was due to hit the city, followed by a narrow front of almost perfect weather, with only a sprinkling of clouds. Split-second timing was of the essence. Our bombers, roaring over Rouen at the exact moment when the expected front was passing, found their gap in the clouds as though made-to-order. The mission was accomplished. Not a single plane was lost.

Allied brainwork didn't discover the weather overnight. As a matter of fact, Hitler was using it as a bludgeon when we didn't even know enough about the rain to come in out of it.

Back in September, 1939, the British General Staff chuckled when Hitler's mechanized armies swept into Poland—the annual rains were due, and German tanks would be paralyzed by "General Mud." But, somehow, it didn't rain. Nor did the Nazi war machine bog down in the Low Countries in May of 1940, although by rights that should have been the rainy season. Again, when the rains came over the Balkans in the Spring of 1941, the British rushed in to support the imperiled Greeks. But, unaccountably, it stopped raining. Nazi tanks rumbled safely through the treacherous mountain passes toward Thermopolae.

Hitler knew what the weather score was. He made storms into storm troops.

In addition to his other duties, Artist Crawford turns out neat graphic summaries of the weather conditions that prevail at the time of various plane accidents in the United States. Below is a semi-abstract visualization of a widespread storm that blanketed most of the country east of the Rockies. This plane crashed in Virginia.



Weather observers posted at all AAF bases take regular readings of wind direction and velocity, report to headquarters.

Simple gadgets are sometimes the most effective. Below, a pair of Army meteorologists release balloon to test wind direction.

In times past, the U. S. Weather Bureau stumbled along with only "skin-deep" analyses of weather phenomena. Its observations were all surface observations, culled from a routine study of the thin layer of atmosphere wrapped around the globe. Wind directions and temperatures, high and low pressure areas in this shallow atmospheric skin were duly recorded. National weather maps were issued daily, presenting this data.

But, so long as only the surface of the weather was scratched, only 24- and 48-hour predictions could be made. That horse-and-buggy approach to the weather wouldn't go in this air age, when lives depend on long-range forecasting. You can't plan a continental invasion 48 hours ahead.

Vilhelm Bjerknes, a Norwegian meteorologist, is the man who fashioned the weather man's new crystal ball. Pioneer in "long-distance" forecasting, he originally worked out the new method of horoscoping things-to-come in the atmosphere. His system, now universally employed, goes by the name of Air Mass Analysis. If Hitler seemed to be in cahoots with the weather back in the days of the Blitz, it was because his prize weather seer, a certain Herr Bauer, had boned up on the Bjerknes system.

Weather forecasting, prewar style, was pretty much trial-and-error. Meteorologists held forth on the subject of departing storm centers and falling pressures; newspapers solemnly promised tomorrow would be "fair and warmer"—but we took along our raincoats all the same, just in case. In those days you read the day-to-day forecasts but, just to make sure, you sniffed the morning air, too, and held your wet finger to the wind. Perhaps you gave up in despair

and just muttered wistful incantations. Which method worked best was a toss-up.

It's all different now, with Air Mass Analysis. We've peeled off the weather's skin and are probing deep into its guts. That's the only way to find out what makes it tick. For—and this is Bjerknes' great discovery—what happens on that earth-enveloping skin is merely a reflection of more basic doings in the upper air.

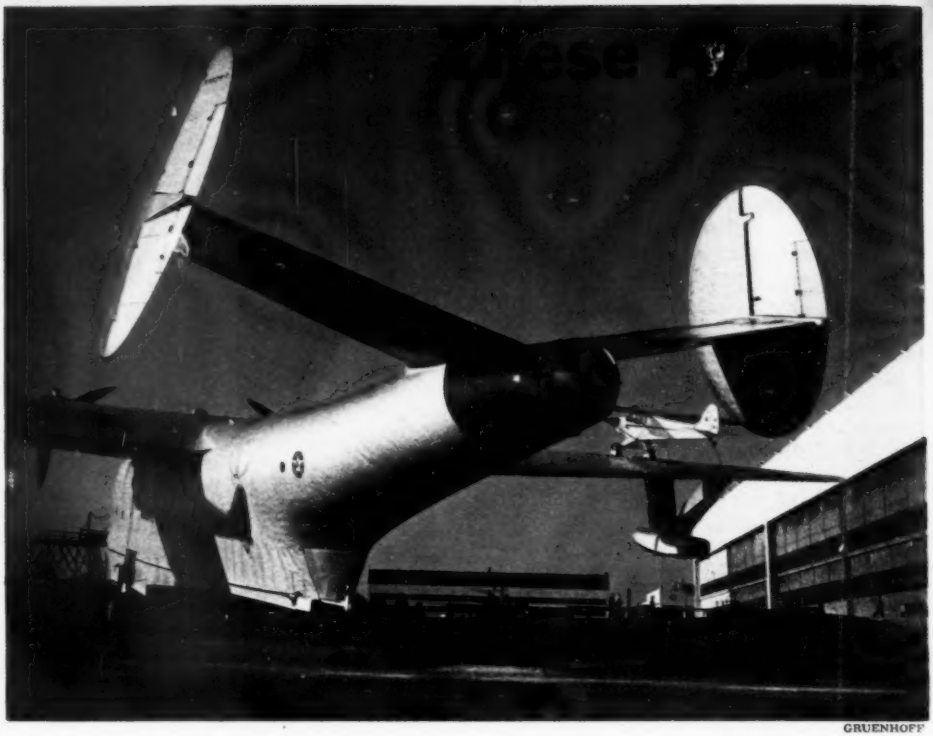
Meteorology, peering deep into the weather's anatomy—seeing weather as three-dimensional for the first time—now views the earth's atmosphere as one enormous ocean, many miles deep. But it's far from homogeneous. Actually, it's composed of several vast bodies of air, each with its own heat, humidity, cohesion, rate of speed, and clarity. At the heart of Bjerknes' method is the discovery that these air bodies move in clearly defined paths over the earth's surface at definite times of the year. The weather that prevails over a given area is the product of the type of air mass hovering over it at the time in question.

There is a great "polar air mass" and also a great "tropical air mass" in the lower stratosphere. The collisions between these two huge bodies in the upper layers of the atmosphere determine the weather patterns on the earth's surface. When the vernal and autumnal equinoxes occur, the positions of these cold and warm masses of air tend to establish six-month weather patterns. To be sure, there are short-term variations, but seasonal patterns tend to run true to form.

Naturally, you have to know more than the mere location of these two perambulating bodies to plot the weather's vagaries. For [*Continued on page* 140]

Best weather man of all is the radiosonde, which ascends on a balloon, then parachutes to earth flashing signals all the way.

Below, an Army weather expert reads wind velocity. His reports, along with thousands more, give headquarters a global picture.



GRUENHOFF

MARTIN MARS: Largest flying boat in the world, having a wing span of 200-ft. and four engines delivering a total of 8,000 h.p. Enormous carrying capacity, formidable armament and extreme range destine the "Mars" to play an important part in winning the Pacific war. Note two-place trainer perched on wing.

CURTISS HELLDIVER (SB2C-1 and A-25): This new dive-bomber has made its debut with both the Navy and Marines in the Pacific, and is now the scourge of Jap shipping and ground installations. A two-man crew has four 50's in the wings and a rear turret at its disposal. Engine is 1,750 h.p. Wright Cyclone.

GRUMMAN HELLCAT (F6F): A Navy fighter designed to "get" the Jap Zeros, and it has done just that, knocking them down like flies in the Pacific. Carrier-based, the Hellcat goes up like ack-ack and maneuvers with electron speed, its heavy armament literally pulverizing the Zeros. Below is British Royal Navy version.

For the NAVY

Planes That Win—

DOUGLAS A-20: Called "Boston" by the RAF, "Havoc" by the AAF, this attack bomber is the most versatile plane of the war. Armed with six nose cannon, two .50 cal. deck turret machine guns, one belly gun and 2,000 lbs. of bombs, the A-20 can sink a cruiser, wreck a factory, shred a locomotive, obliterate an enemy bomber or support ground forces. Two 1,600 h.p. Cyclone engines give the A-20 a speed of approximately 300 m.p.h.

REPUBLIC THUNDERBOLT: The P-47B high-altitude fighter is the largest, most powerful single-engined fighter plane in the world! A 2,000 h.p. turbosupercharged engine gives it a speed of better than 400 m.p.h., and it carries eight .50 cal. machine guns.

NORTH AMERICAN P-51B MUSTANG: Long-range fighter and bomber escort that's hanging up an envious record in raids on Germany. The "Mustang" travels at 400 m.p.h., impelled by a Rolls-Royce Merlin engine of 1,520 h.p. It has heavy fire power (8 machine guns).

Fortress vs. Liberator

THE controversy rages on, among pilots, technicians, the public—which is the better airplane, the B-17 Fortress or the B-24 Liberator?

Both are of an approximate size, speed, range, carry equivalent bomb loads and armament. Both have accomplished miracles in battle and played a major part in winning the war, though the Fortress has, perhaps, been more widely publicized. Both have been dubbed "four engine fighters" by enemy pursuit pilots who have crossed machine guns with them in combat and lost.

It has been said that the Liberator is less maneuverable than the Fort; that the Fort is slower and less stable than the Liberator, and so on. We think these rumors are unimportant. The only thing that counts is the record, and that shows both of these airplanes as truly *great* airplanes, outstanding examples of what American engineering and flying genius can accomplish in an incredibly short time when faced by a national crisis.

CONSOLIDATED LIBERATOR B-24: With its cousin and contemporary, the Fortress, our B-24 is sharing the job of systematically bombing Germany out of the war. When this task is complete, the fury of the "Liberator's" gun-bristling fuselage and 6,000 lb. bomb load will be turned on Japan. Specifications are as follows: Span, 110 ft.; length, 63 ft.; Weight loaded, 41,000 lb.; Speed, approximately 300 m.p.h.; Power, four 1,200 h.p. Pratt & Whitneys.

VOUGHT-SIKORSKY CORSAIR F4U-1: Another 400-mile-an-hourer. Carrier-based, the "Corsair" can be recognized by its unique "gull wing" design. The same 2,000 h.p. Pratt & Whitney engine used in the "Thunderbolt" also powers this craft. As a fighter, the "Corsair" mounts at least six .50 cal. machine guns and possibly several cannon.

LOCKHEED LIGHTNING: The famous P-38 interceptor needs little introduction. As a bomber escort the graceful ship's long range, heavy fire power and terrific speed make it unsurpassed. Span is 52 ft.; speed 400 m.p.h. "plus"; power, two 1,150 h.p. Allisons. Armament includes cannon and .50 cal. machine guns.

PHOTOS ON PAGES 74-75-76-77 THROUGH COURTESY OF MANUFACTURERS: GRUMMAN AIRCRAFT ENGINEERING CORP.; DOUGLAS AIRCRAFT COMPANY, INC.; CONSOLIDATED AMERICAN AVIATION, INC.; BOEING AIRCRAFT

THESE PLANES ARE

BOEING FORTRESS (B-17): Cutaway painting by Boeing artist Norman Dawn shows the 30-ton Fort in action against Jap planes somewhere in the South Pacific. The nine-man crew is at battle stations; pilot is holding course while scanning sky for enemy planes, bombardier is laying his "eggs" and the other seven, including navigator, radio operators and engineer, are at gun positions. Fort specifications: Span, 104 ft.; speed, about 305 m.p.h.; ceiling 35,000 ft.; range, 3,500 miles. Four 1,100 h.p. Wright Cyclones provide the power.

DOUGLAS DAUNTLESS (SBD-3): Precision divebomber, credited with sinking more Jap "combat tonnage" than any other Navy plane. A 1,000 lb. bomb load gives the "Dauntless" tremendous striking power as it swoops in on the enemy at a 300 mile pace. Span is 41 ft.; engine, 950 h.p. Cyclone.

NORTH AMERICAN MITCHELL (B-25): Queen of medium bombers, the B-25 earned its place among the great airplanes of all time by the historic Tokyo raid, launched from the deck of a carrier. Despite its much smaller size (span, 67 ft., weight, 24,000 lbs.) the B-25 totes almost half a Fortress' bomb load.

COURTESY OF FOLLOWING AIRPLANE MANUFACTURING CORP.; CURTISS-WRIGHT CORP.; REPUBLIC AVIATION, INC.; NORTH AMERICAN CRAFT CO.

Exploits of cruisers, flat-tops, destroyers are almost legends now. Do you know about the ship Lt. Lott (left) has taken to his war-heart?

by Lt. Davis Newton Lott, USNR

Dull, Dirty and Damn

"SUBMARINE battle-surfacing! Bearing two-seven-zero! Three hundred yards!" The lookout shouts his warning from his post topside on the flying bridge and you automatically reach behind you on the aft bulkhead of the pilot house to jerk the red-knobbed General Quarters switch. Throughout the ship steel-throated Klaxons urge your men on the double to their battle stations.

"Left full rudder. Both engines ahead flank. Ram 'er at the conning tower, Quartermaster," you say to your men at the wheel and the engine controls.

You're so close to the sub your crew can't depress the gun low enough to open fire. So you bark: "Stand by for collision! Clear the fo'c'stle!"

In a flash the forward gun is cleared as your seven-man gun crew scurries to safety behind the pilot house.

You reach up and yank the collision siren lanyard. As the siren shrills its warning to your damage control party below decks to begin shoring up the forward bulkheads, you order your engines: "Both engines stop." You wait for the shock of collision, then: "Both engines back flank." You're going to back off to open the hole you have made in the sub. Otherwise your bow might plug the gap. Then, after you've backed away, you'll ram her again at emergency flank speed.

But you needn't worry about this particular sub any longer for your lookout shouts down the voice tube: "Submarine destroyed! Enemy aircraft approaching at zero-four-

five! Position angle thirty degrees!"

You order: "Both engines ahead flank. Left full rudder. Come to forty-five degrees from course." This will put the diving plane dead

Dangerous

on your starboard beam where both your big fellow and your fast barking anti-aircraft guns can be brought to bear. You speak again.

"Man the forward gun! Jap bomber at zero-nine-zero! Position angle thirty degrees!" The gun crew jumps to their places again and the muzzle of the forward gun swings swiftly right and upwards. "Range nine-oh-double-oh! Scale five-one-zero! Cut fuzes to two-point-two! Commence firing!" The gun crew goes into action to lay down a barrage of bursting anti-aircraft shells the plane will have to pass through to reach its bomb-release point. Then, if he comes closer to strafe, your anti-aircraft will open fire.

You feel a thrill of pride at the way your men—green "boots" only a few weeks ago—are manning the guns like blooded veterans. True, some of them still call the bulwarks, "banisters"; the decks, "floors"; the bulkheads, "walls." But you know each man is in there *trying*—and that's why the comparatively few hours of drill you've

[*Continued on page* 146]

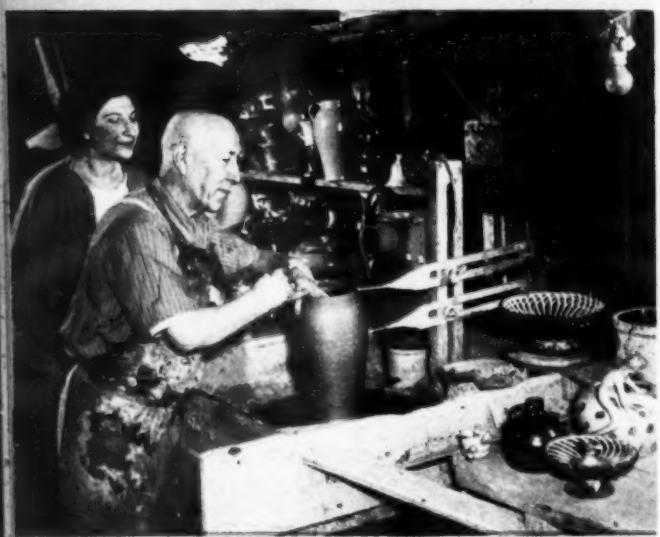
Minesweepers have 3 officers, captain, engineering officer and executive. Above, the skipper watches while the quartermaster takes a pelorus bearing.

The hot and cold shell boys go into action with a 3-inch gun. Loading takes calm and precision, but the hot ejected shells call for asbestos gloves.

Pottery Fights

by Louis Hochman

One of the most ancient and peaceful world arts goes to war in the biggest and most savage conflict of all time.



Above, plates are on pressing machine. Mrs. Henderson checks inside dimensions of a mold. Below, a mass of clay grows into a shapely vase under the skilled hands of a master potter.

LIKE a baker, the potter wedges his clay. Then, taking a portion of the shapeless mass, he slaps it down in the center of a revolving turntable and plunges his clay-begrimed hands into it. Deftly his skilled fingers manipulate the revolving mass, pressing down here, guiding edges there. As his hands begin to rise the clay seems to follow them upward, as if by magic, gradually taking on the shape of a beautiful vase. In a matter of seconds the shapeless mass of clay has become a decorative vase.

This fascinating scene is a daily occurrence at the Dorchester Pottery Works in Boston; but today pretty vases are not the finished products of the potter's skilled hands. Instead, he is turning out such vital items as bean pots, acid vats and pitchers, perforated acid dipping baskets, stone piping for water systems, etc. Pottery, one of the most ancient of arts, has gone to war. The Dorchester Pottery Works are 100 per cent on war production.

The driving force behind this bustling factory is Mrs. Ethel Hill Henderson, a woman of tremendous energy and vitality, who manages the production end while her husband, Charles W. Henderson, takes care of the business end. Originally a clothing designer, she married into the pottery industry and quickly adapted her artistic talents to the ancient art of the potter's wheel.

Not interested in bric-a-brac, Mrs. Henderson produces

only useful objects of pottery; but that, however, doesn't interfere with their being decorative as well. She dreams up many useful items in her own home as the need for such items develops; then has her skilled potter make them up to try out. Her home is stocked with many unusual and useful items of her pottery, which, before the war, were successfully placed on the market after they proved themselves.

Once a buyer came in while she was testing a newly designed table stove,

Above, turning pitchers on jiggering machine. Left, tightening the filter press (press in background). Below, after the firing pottery is stone-hard and glazed in different colors.

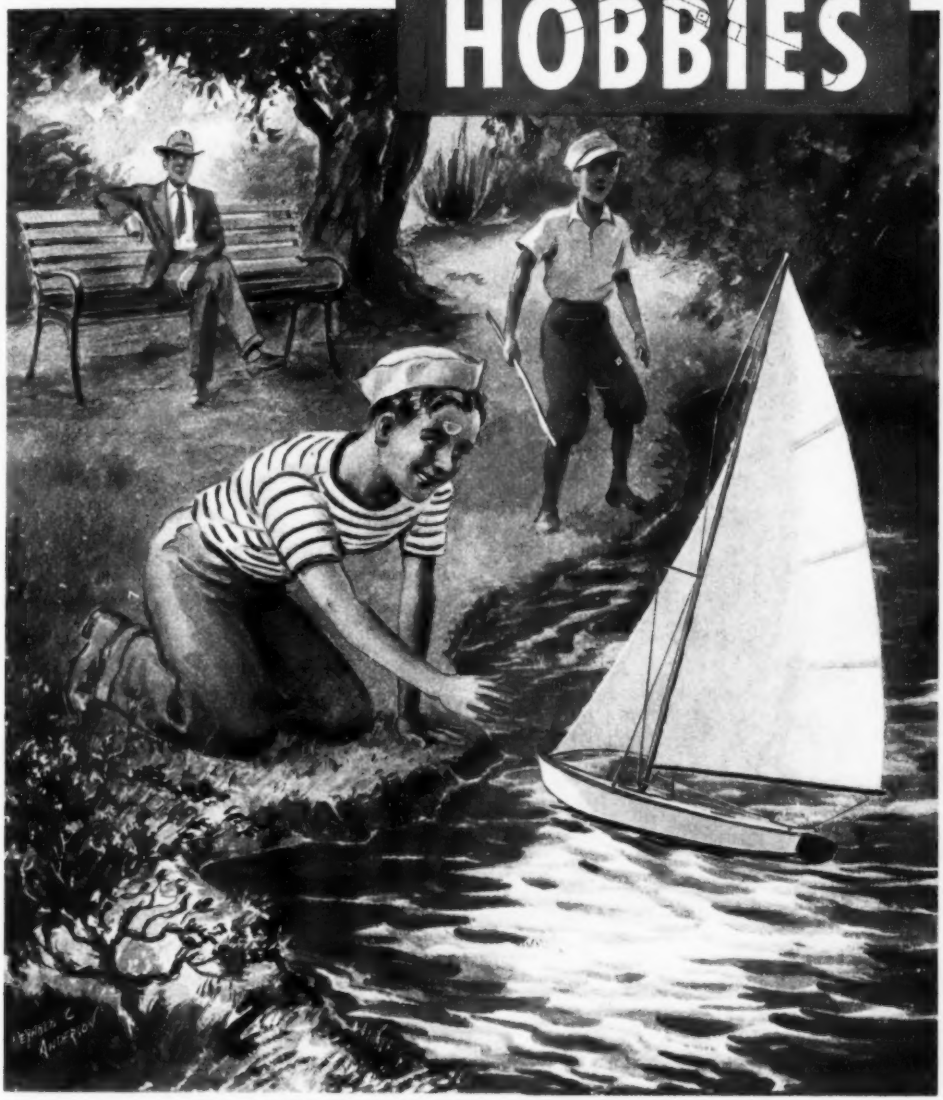
fashioned from pottery to keep food hot on the table with the heat of a single candle inside. Before even waiting to see how successful the device was, he ordered 250 of them, so sure was he of its value. When war broke out, Mrs. Henderson aided the war effort by reproducing in stoneware parts of captured enemy equipment to permit our engineers to study and improve on them. Today, however, we are so far ahead of our enemies in equipment quality, that she is no longer required to do this. She does, [*Continued on page* 150]

Model Young Man

CARL BAKER is a young man from Bentonville, Arkansas, who, like many other American boys, is an ardent model builder. When he was just six years old he built his first model, an airplane. He's thirteen now, a high school freshman and has completed more than 150 models, including a complete set of modern, mechanized war equipment. Young Baker's family found it necessary to build him a workshop, as his hobby expanded faster than they could move out of the way. Not all Carl's models are copied from the real thing—he has designed several of his own, both ship and plane, embodying latest scientific and aerodynamic principles. The photo above shows Carl in his shop surrounded by a few of his models, and his constant companion, Roscoe. He's typical of kids all over America who will one day be the backbone of the nation's air-power.

CRAFTS AND HOBBIES

Developed-surface sailing model by William F. Crosby. See page 92.



HOME WORKSHOP • FISHING EQUIPMENT • MODELS • TOYS
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HOW TO TIE ONE ON

Making flies and other artificial lures is almost as much fun as catching fish! Two experts tell you how.

by Fred Hildebrandt
and Herb Howard

IF YOU'RE contemplating joining the Grand Order of Fly Ty-ers, consider carefully before you leap! They have a lot of fun, and they catch a lot of fish, but they're not (shall we say) exactly normal. Every once in a while tales of their peculiar habits are brought to our attention, and from these we can see why even their most intimate friends, having learned from sad experience, grab their furs, feathers and tinsel and run for cover whenever a veteran Fly Ty-er appears. Children's teddy bears are skinned to the sawdust, wives' knitting bags pilfered and dogs run about with evidence of strange baldness.

There is the case of a famous jurist, who like a schoolboy reading the comics behind his geography, practiced tying knots behind the shelter of his desk. While lawyers argued a weighty problem before him, he visualized the leaping salmon his fly would later hook. An executive, during a heated debate as to the merits of the fly he was tying, suddenly realized he had tied his thumb tightly to the

Fig. 1. Here are the tools: 1—scissors, 2—clips, 3—brush, 4—stiletto, 5—knife, 6—thread holder, 7—vise, 8—corks, 9—balsa, 10—cedar, 11—hacksaw, 12—file, 13—varnish, 14—hooked awls, 15—plastic wood.

Fig. 2. Start thread on the hook as shown here.

Fig. 3. Bucktail is scarlet wool (below).

hook. He'll never live that down! An angler, when asked where he got the unusual fur for the fly he was using, said it came from a dog. A final confession, however, revealed it was wrenched from the ears of a toy animal his nephew had cherished greatly.

It gets you, this fly-tying bug, and is no less attractive than fishing itself.

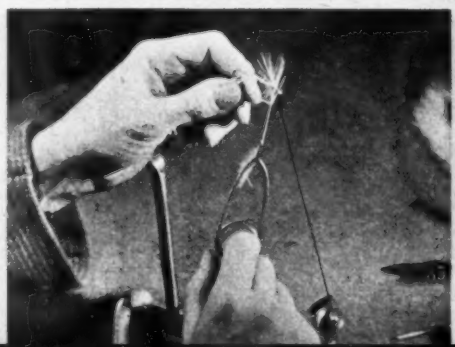
Tools for tying flies, making bass bugs and plugs are shown in Fig. 1. Hooks come in various types and sizes. For trout they should be from No. 18 to No. 8, using those of light wire for dry flies, No. 13 to No. 10 being most suitable. For bucktails and streamers, use long-shanked hooks of heavier wire, No. 10 to No. 2; for bass flies, No. 8 to No. 2/0.

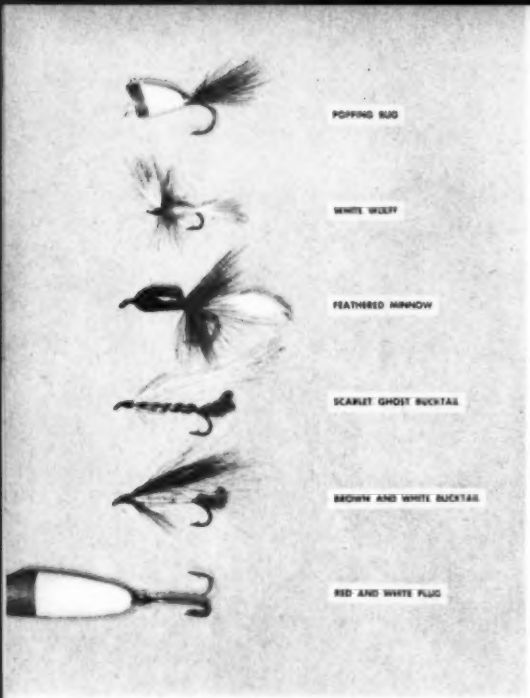
Bass bugs require a kinked-shank hook, or a small piece of metal soldered to a straight shank, to prevent it from turning in the body; No. 2 to No. 2/0 fills most needs. The bodies are made of balsa wood or cork. Balsa, in dowel form, saves time in working. Bodies of pine or cedar and treble hooks are used for plugs.

Hackle feathers may be purchased by the dozen; whole necks are preferable, usually having a complete range of sizes. The most important colors are brown, blue-gray, ginger, grizzle (gray), black,

Fig. 4. Trim scarlet wool tail to taper as below.

Fig. 5. Wind on three or four turns of scarlet hackle.





Construction of these lures is explained in text.

yellow and scarlet. Bucktail flies require hair from deer tails. White and natural brown are most popular, but many other colors such as dyed scarlet, yellow and black are used. Polar-bear hair, squirrel, fox and skunk tails are often substituted. Trout-fly bodies are made of wools, furs, peacock herl, quills, chenille, silk floss and tinsel. Most of these also are used for the bodies of bucktails,

streamers and bass flies. Trout-fly wings are made with flight quills, wood duck, teal, mallard, turkey, pheasant and small oriental bucktails.

For the *Brown and White Bucktail*, place the hook in a vise and tie a piece of waxed tying silk, about 18" long, to the hook shank over the point. Start the thread by jamming one turn over the preceding one (Fig. 2). Make two turns toward the rear keeping them close together and even. Place the thread in a thread holder or secure with a half hitch to keep it taut. It is very important to keep tension on the thread until the fly is finished.

For the tail, cut a piece of scarlet wool 1" long, using two strands. Place on the hook extending rearward (Fig. 3), tying with a loop of thread. Fig. 8 shows this method being used for wings, with the loop slightly exaggerated. When the thread has been brought around directly under the hook, pull it taut. This tightens the loop evenly around the wool and hook, preventing it from slipping. Re-

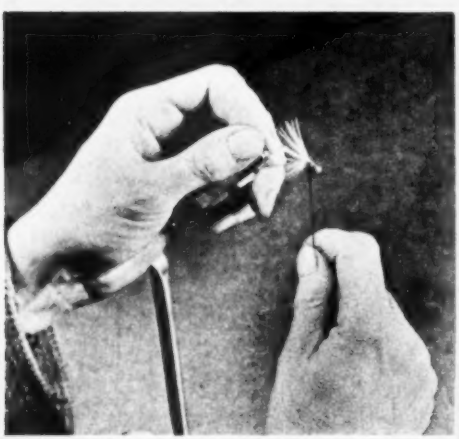


Fig. 8. Hackle must extend backward at 45° angle.

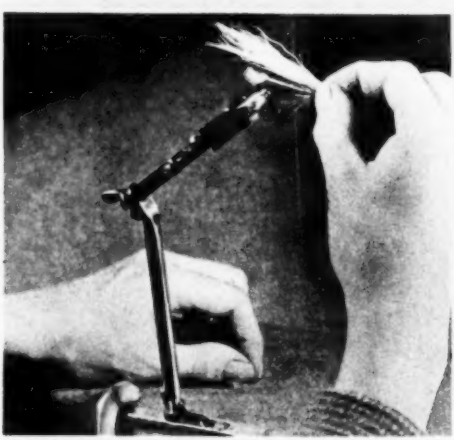


Fig. 7. Underwing is white hair from a bucktail.

peat several times and then cut the forward, waste end of the wool to a taper with a scissors (Fig. 4). Make a few turns over the butt and continue winding forward to the eye. Leave plenty of space to tie off the head by not working the body or wings too close to the eye.

Taper one end of the tinsel body material for ⅛" and tie on near the side of the hook at the taper with two turns of thread. Fold over the lower end of the tinsel and secure with two more turns. Wind the tinsel back until it covers the windings which secured the tail, keeping the turns close together but not overlapping. Wind it forward again and secure with two turns of thread. Cut off the short end and make two additional turns.

To prepare the hackle, proceed as follows. Select feather with fibers of the proper length. Hold it by the tip and run your fingers downward over the fibers, spreading them at right angles. Strip about half the fibers from both sides from the middle down and fold them over as though closing a book, with the center quill as the hinge and with the top or glossy sides out.

Tie this prepared hackle (scarlet in this case) by the tip where the tinsel ended, with the fibers extending backwards, cutting off the waste tip end. Wind forward three or four close turns, one in front of the other, but do not overlap (Fig. 5). Secure with three turns of thread and cut off the butt end. Bring the thread back over the forward edge of the hackle with

Fig. 9. Work varnish in butt ends with a stiletto.

Fig. 10. Use white wool body for White Wulff.

Fig. 8. Tie with loop of thread. (Same as for tail.)

Fig. 11. Fasten two dry-fly hackles as above.

Fig. 12. Wind all turns but one in back of wings.

Fig. 13. The Popping Bug has two legs of bucktail.

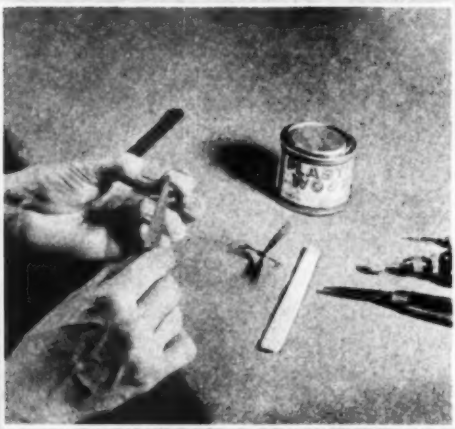


Fig. 14. Bodies are shaped from balsa wood or cork.

enough turns to make it extend backward at an angle of about 45° (Fig. 6).

Cut a bunch of white hair from a bucktail for the underwing. Remove thoroughly all fuzz and short fibers by shaking smartly and then working them out. Hold it to the top of the hook to determine the proper length (Fig. 7). Then tie on as you did the tail (Fig. 8). Cut the butt end at a taper and over this tie a bunch of brown in the same manner. Hold firmly while trimming butts so as not to dislodge the wings and then work varnish into the butt ends with a stiletto (Fig. 9). Tie off, winding evenly and tapering toward the eye. Secure with several half hitches and varnish the head.

For a wool body with tinsel rib as in the *Scarlet Ghost,* tie on the tail as with the first fly, leaving about 6" of wool at the forward end with which to wind the body. Thus tail and body are of one piece. Tie the tinsel on the near side of the hook shank between the point and barb and bring the thread forward. Wind the body forward covering the windings which tied on the tinsel with the first turn. Then wind up the ribbing tinsel in evenly spaced spirals, the first turn covering the windings that tied on the tail. Tie off and proceed as with the first fly. Streamers differ only in the wings, hackle feathers being substituted for bucktail.

The *White Wulff* is used for a dry fly example. This method is used for most dry flies but materials will differ, of course. The procedure for the various steps, unless otherwise stated, are as for the first fly.

Tie on the thread ⅛" in back of the eye; wings of white bucktail are used. (Oriental bucktails are finer and easier to manipulate.) Place so the tips extend over the eye and tie down (Fig. 8). Then hold the wing upright and make 10 or more turns of thread directly in front of them which should hold them in that position. Now separate them into two equal parts. While holding the half nearest you, bring the thread up between the two wings, in front of near wing and in front of far one in a figure-8 design. Repeat several times. Then make several complete turns around the base of each wing. Now they should be divided and cocked at the proper angle. Bring the thread back and tie on tail, also of white bucktail. Tie in a body of white wool at the base of the tail (Fig. 10), and bring the thread forward not quite up

to the wings, leaving room for the hackles.

Tie on two dry-fly badger hackles—white with dark centers. Strip off the soft lower fibers and tie on together by the quills, just below the remaining fibers and directly in back of wings. Do this by holding them diagonally over the hook (Fig. 11) with front or glossy sides forward, and secure with three turns of thread. Tie down the butt ends with three turns in front of the wings and cut them off close. Wind evenly and tie, keeping all turns except the last in back of wings (Fig. 12). This spreads the fibers at right angles to the hook. Cut tips, secure with half hitches and varnish the head.

The *Popping Bugs* are popular and effective fly rod lures. Though essentially alike they vary in construction by placement of wings, legs and body shapes. For a good example, tie bucktail legs to a kinked-shank hook. Place these on the shank over the point of the hook, dividing them into two equal parts, 1½" long and extending back at a 45° angle (Fig. 13). Use the same method as for tying wings on a dry fly but do not bring them upright.

The bodies are made of balsa wood or cork as they must be light to be cast well with a fly rod. A good average size is 1" long and ¾" in diameter. Shape a piece cut from a dowel by tapering toward the rear with a sharp knife, and then smooth down (Fig. 14). Flatten the bottom slightly. With a hacksaw blade cut a groove lengthwise along the center of the underside for the hook; make it about $\frac{3}{16}$" deep at the head and $\frac{1}{16}$" at the rear. Hollow out the front of head for about ⅛", leaving a $\frac{1}{16}$" rim. An electric hand drill is good for this purpose (Fig. 15). Insert the hook into the groove bringing the body back to the windings which tied on the tail. Fill in with plastic wood and let harden (Fig. 16).

Paint them any color you prefer. Apply two coats of undercoating as balsa is very absorbent, and then finish with several coats of lacquer or enamel.

The body of a *Feathered Minnow* usually is made of cork. Finish it first, cementing it to the hook as with the Popping Bug. An average size is ¾" long and ⅜" in diameter. Flatten the underside slightly and taper the head by filing a bit from either side. Finish as before. Select from four to ten hackle feathers and arrange them evenly, tying them back to back to the hook at the rear. Now tie three hackles prepared as for the bucktail fly by the tips on the hook over the point. Wind them separately up to the body.

Plugs are much larger and are made of pine or cedar; they can be turned on a lathe or whittled by hand. Treble hooks are attached to the body with screw eyes or single hooks can be used. A screw eye also is placed at the head to hold the line or leader. Plugs vary from 2" to 6" in length, the larger ones being used for pike, muskellunge and even tarpon. One treble hook, sufficient for small plugs, should be placed at the rear; when using more, space them evenly along the bottom or sides. Plugs are of many shapes, some resemble minnows, frogs or mice. Many are weighted to make them swim deep.

Fig. 15. Electric hand drill hollows head easily.

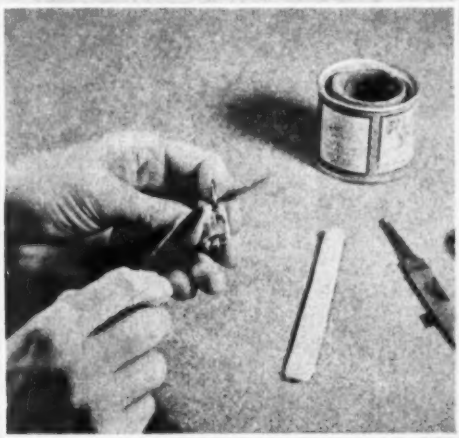
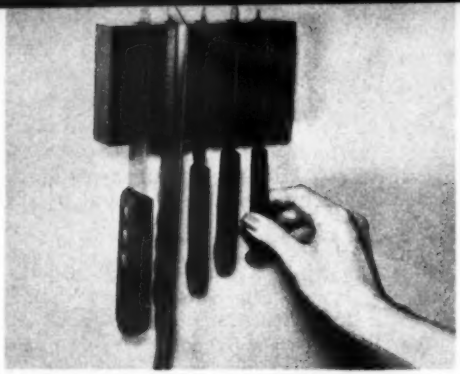
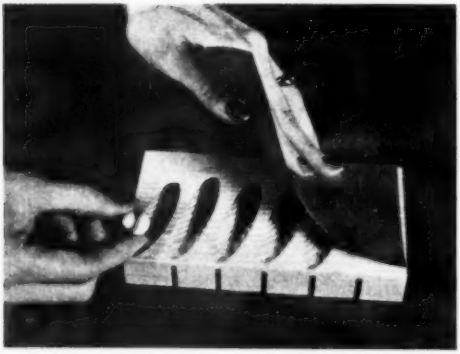


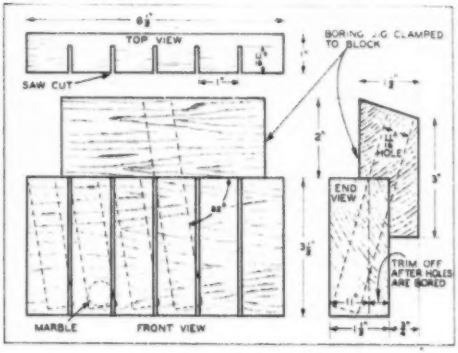
Fig. 16. Hook is sealed in body with plastic wood.



Knife Holder

THIS is just about the simplest thing you can find in a knife holder. Start with a piece of 1½" material 6½"x3½". Using a $\frac{7}{16}$" bit, holes are bored easily with the aid of a simple jig. After this has been done and a series of saw cuts made in the face of the block, the back is trimmed off leaving the block 1" thick. Marbles are dropped in the holes from the back and a piece of stiff paper or cardboard is glued on to cover the holes. A natural or enamel finish then is applied. Decorate with decals.



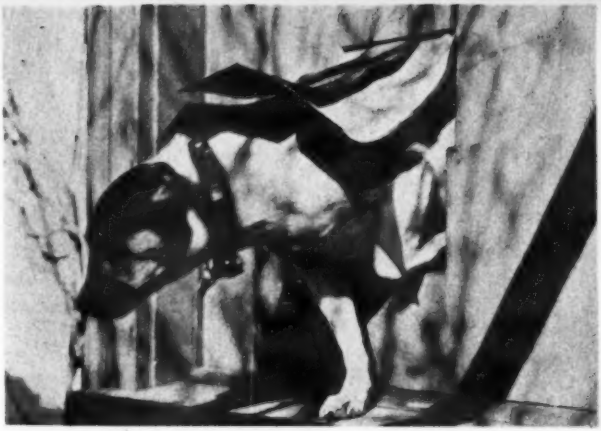


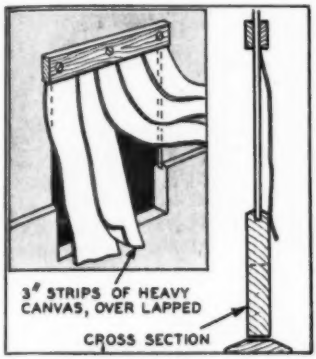
Folding Table

A TABLE which can fold into the wall is quite an asset to a small, studio apartment. This young lady has devised one which serves as a dining table at meal time and when not in use, lifts at one end to become part of the wall space between two windows. A single hinge holds it to the wall, and two legs on the other end fold back and are hidden by the window drapes when it is raised. An attractive picture increases the camouflage.

Doggie Door

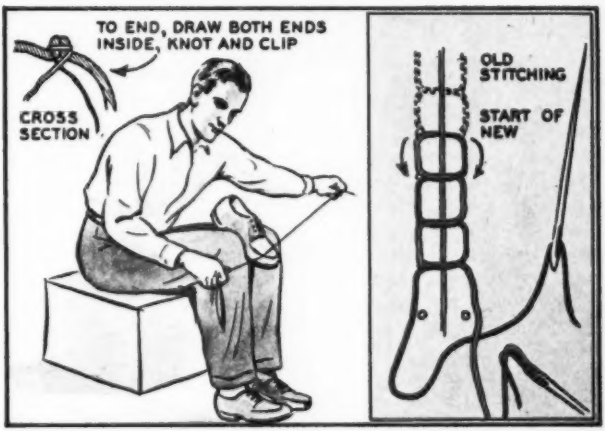
WITH this door installed, your dog can come and go as he pleases without disturbing the family. The heavy canvas strips over the opening will keep out flies and drafts. Overlap them as shown.





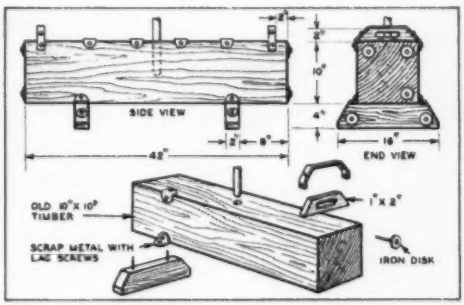
For Moccasins

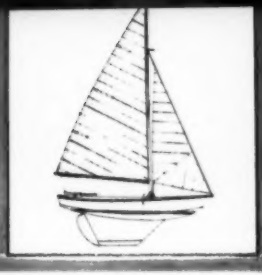
WHEN the stitching of your moccasin-toed sport shoes wears and breaks, repairs are easy. Use three strands of waxed, light twine and two darning needles. Start a few stitches ahead of the worn ones and proceed as indicated, working through the old holes.



Garden Umbrella Rest

THIS umbrella support, patterned after a treasure chest, can be built of scrap. Iron fixtures add to the effect. Handles enable it to be moved easily about the garden.





DEVELOPED-SURFACE *Sailing Model*

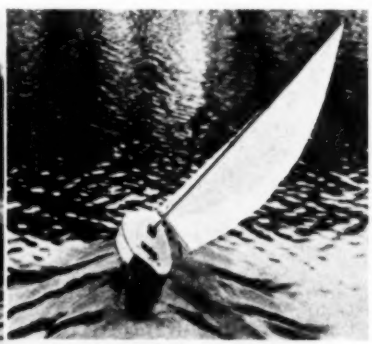
by William F. Crosby

DURING the past few years the writer has designed a considerable number of boats, sail and power, to be built from sheet plywood. As everyone knows, this material cannot be used where there are compound curves because you just can't bend plywood, or anything else for that matter, into a compound curve without getting all sorts of bumps and buckles. In boats of this type, we have been using developed surfaces; conical, cylindrical or some other form, which permit the use of sheet plywood without bumps or difficulty. Developed surfaces in themselves are nothing unusual—any high school boy or girl encounters them in geometry. The trick is to apply these surfaces to a boat and come out with something that resembles a boat.

Obviously, we cannot develop the entire hull from side to side in one piece because there would be many compound curves, but if we take a vee-bottom boat we can develop each side of the bottom and the sides above the chines—each as a separate development, yet the whole going together to form a real boat.

If we can develop a surface for sheet plywood, we can also develop a similar surface to take steel or cardboard. As a result you see on these pages a vee-bottom sailing model, designed with developed surfaces and on which it is possible to place ordinary three or four ply Bristol board (drawing paper) with the utmost ease. This means that such a model is practically a matter of a very few hours to complete. It also has several other advantages. By using this material instead of the old fashioned method of whittling out from a solid block of wood, one can have a model that compares proportionally in weight with a real boat. The result is a far better sailing model than any other of its type or size.

Actually, this boat was designed in two or three evenings. The hull was constructed complete, ready for paint in one Sunday. The entire job was done in one week of spare time including sails and rigging. No so-called critical material is used and it is so simple to build that anyone should be able to complete it successfully. And does it sail? Even old time model men have been amazed at its performance. It won't capsize because it will heel over in a hard puff and spill the wind off the sail. Of course models should be sailed in light airs, seldom more than five mile breezes for best results. In fact this little craft will move right along when the air is scarcely perceptible.



Trim, light and fast, the model rides the water like a duck and holds well to her tack as she speeds along.

The first step in construction is to make the lines full size as shown in Figure 1. These may be drawn on an ordinary

The designer of the famous "Snipe" designed this scientific little sailboat. You'll be amazed at its simple construction and realistic performance.

sheet of wrapping paper and the curves drawn in by using light strips of wood, called battens, fastened down with pins. Draw in the waterline first, then the station lines every four inches. Then from the waterline up lay off the bow and stern. Below the waterline draw in the lines representing the keel. The wood of your fin keel is actually ¾" less than the dimension shown to the bottom on this drawing. This represents the lead weight. From the sections above the profile you can get the heights to the sheer and chine above the waterline and you can also get the lowest part of the hull-keel. On another piece of paper draw all the sections as shown. The trick now is to get these lines transferred to the wood.

This is easily accomplished by putting a

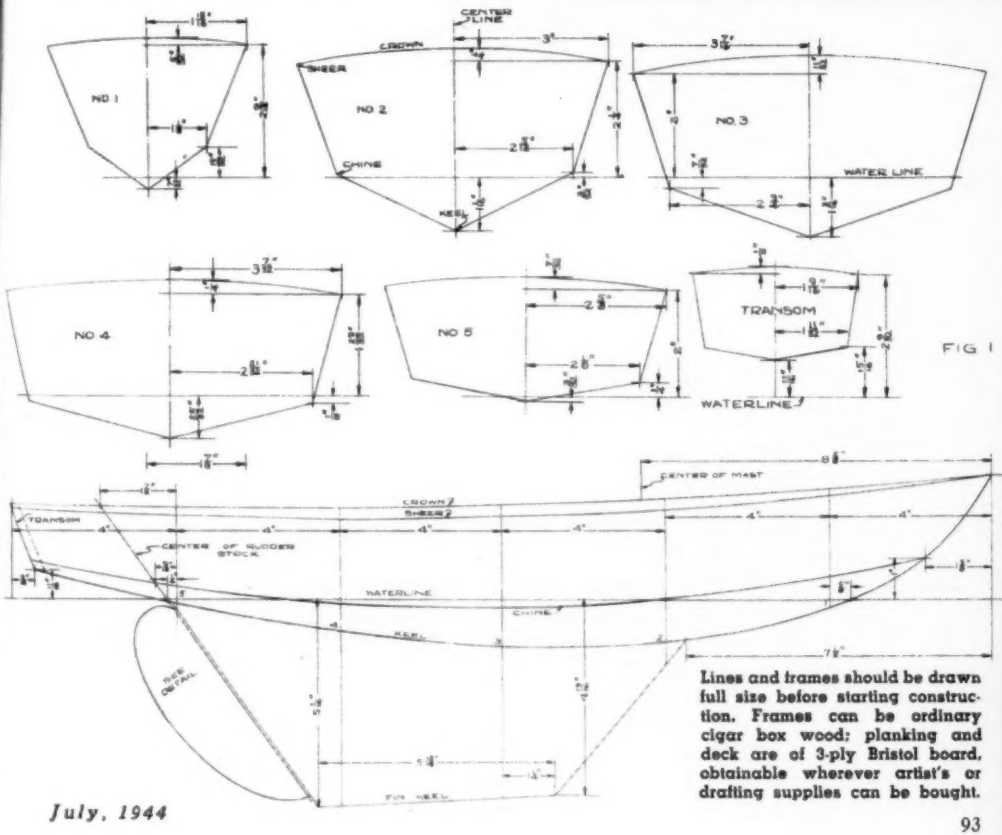


FIG 1

Lines and frames should be drawn full size before starting construction. Frames can be ordinary cigar box wood: planking and deck are of 3-ply Bristol board, obtainable wherever artist's or drafting supplies can be bought.

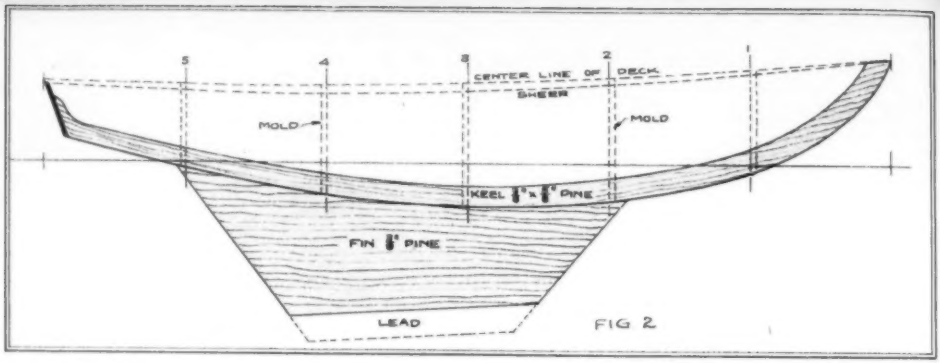


FIG 2

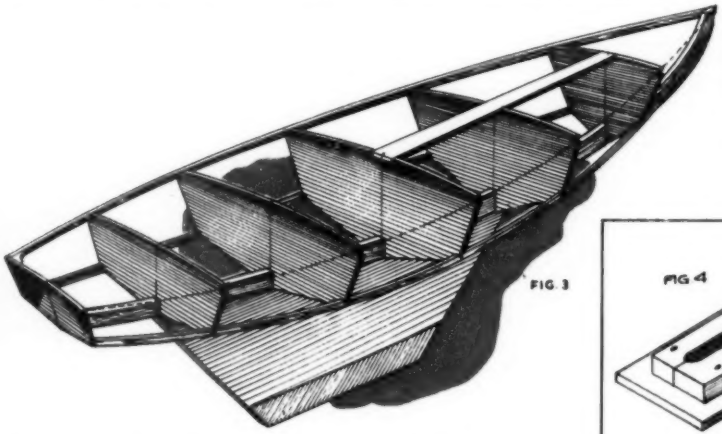
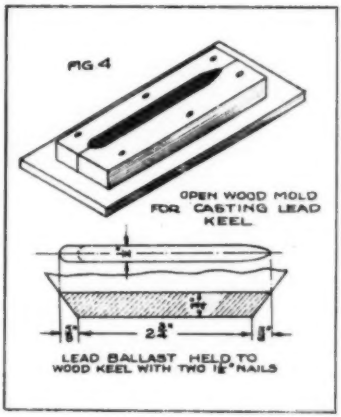


FIG 3

Left: This is how the frame and keel assembly will look when set up. Bristol board planking will fit like glove.



piece of carbon paper, face downward, under the drawing and on top of the wood. Sections or molds may be made from ordinary cigar box wood if you desire. In no case need they exceed ¼" in thickness. Plywood is not so good for making them even if you could get it. Draw the outline on top of your drawing and the carbon paper will leave the outline on the wood. Do the same with the outline of the keel—see Figure 2. This member is one piece of wood from stem to stern about ⅜" thick and ⅝" up and down. The station marks should be drawn through at the same time as you make the rest of the drawing in order to locate your molds on the keel itself.

Note that the aft end of the keel is cut off a little so that the stern or transom will come out, giving the boat the proper over-all length. How much you take off here depends on the thickness of the transom. Cigar box wood will make a handsome transom if you will take the trouble to sand it a little and give it several coats of varnish.

The molds are notched to come down over this keel and are held in place with some of that good, new waterproof glue (cascamite) and a few brads driven in to hold them while the glue is setting.

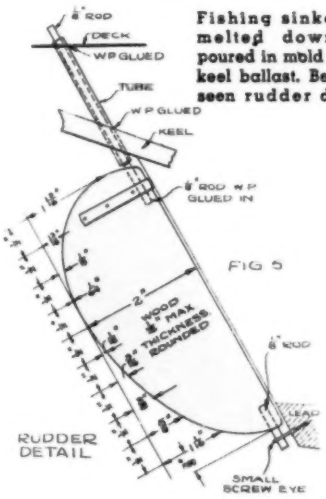


FIG 5

Fishing sinkers are melted down and poured in mold to make keel ballast. Below are seen rudder details.

Note that the molds 1 and 2 are placed with their aft edges coming on the line of the mold. The molds 3, 4 and 5 are placed with their forward edges coming on the line of the mold. This is done to simplify any bevelling that may have to be done.

The corners at the chine and sheer are next notched out to receive light battens about ⅛"x¼" which run all the way from bow to stern. These are shown clearly in Figure 3. The one at the sheer nearest you in this drawing is shown only as a dotted line. The edges of the molds are bevelled off to the curve that these battens take and the bottom of the keel is also bevelled to the same amount of vee as appears in the bottom of the molds. When completed, the battens, molds and bottom of the keel should all be an even curved surface. This will help you when you start putting on the bristol board. There is considerable bevel in the bottom of the transom. Small brads, about ⅜", are used to hold these battens in place to every mold and at the stem and transom.

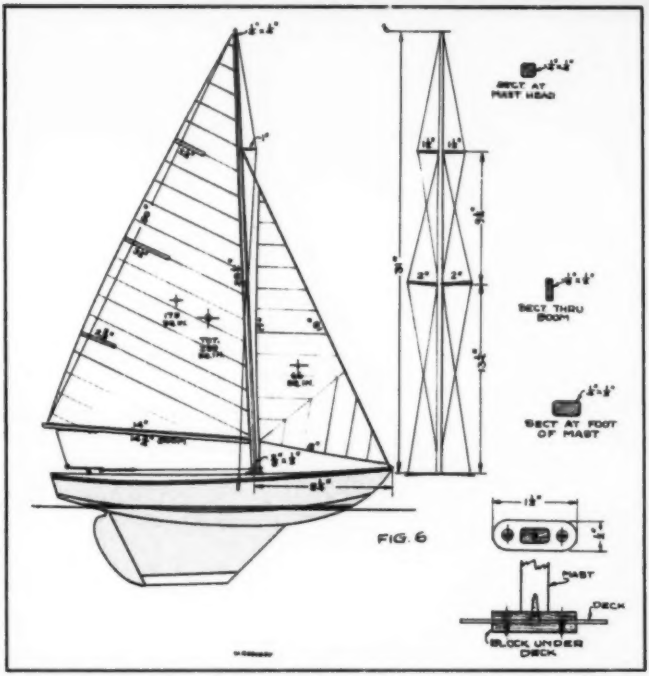


FIG. 6

The bristol board should go on next. Hold it with clamps up along the side of the boat so that it curves from bow to stern and covers one side from sheer to chine. Mark the edges along the battens. Then take it down and cut to shape, making it a little full so that the edges may be trimmed flush later on. While you're at it, make a duplicate for the other side of the boat. Make it long enough so that it hangs out beyond the transom about a quarter of an inch. Now hold it up in place again and get the shape of the stem. Hold it carefully and mark it as exactly as possible. The bristol board will come even with the leading edge of the stem. Of course, your stem has to be bevelled off the same as the bottom of the keel.

Now paint some [*Continued on page* 132]

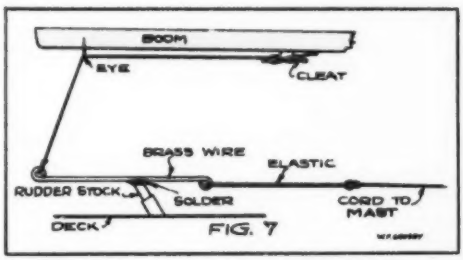


FIG. 7

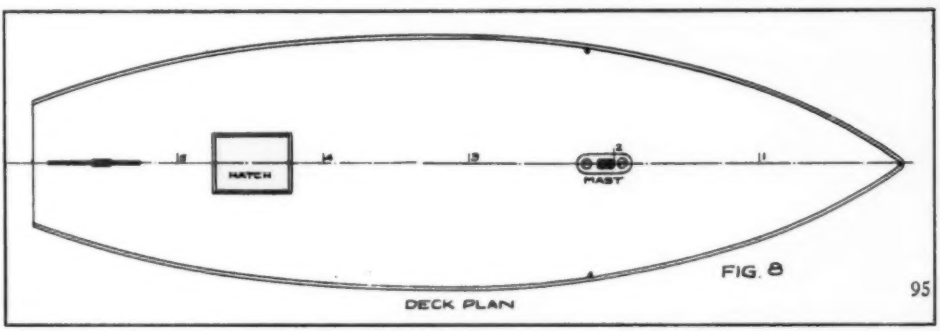
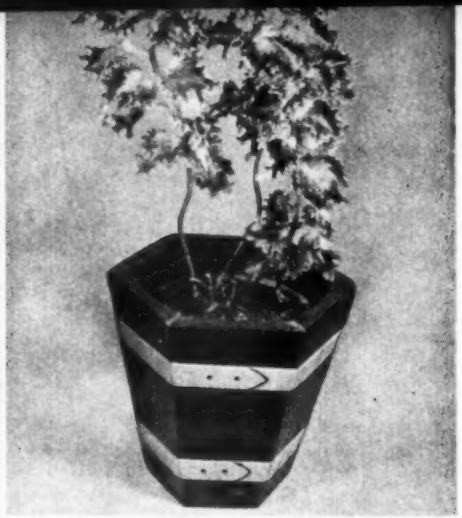


FIG. 8
DECK PLAN

WOODEN JARDINIERE

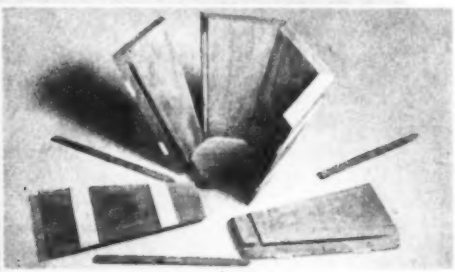
THIS attractive walnut jardiniere with its decorative maple bands is a worthy setting for the most beautiful of plants. It is made from six pieces of ¾" stock cut roughly to shape. The grooves for the maple inserts are dadoed as in the photo, and the maple strips are cut and glued into place. Next the edges are beveled on the bench saw and run over the planer. Grooving for the strips that connect the pieces is the next operation. Note the blind dado. Grooves also are made to receive the bottom which is a six-sided piece cut from ¼" material.

The jardiniere is assembled and held in place with webbing while the glue dries. Details of the simple webbing clamp arrangement are in the drawing. After the glue has set, the bottom end is trimmed uniformly and glued to a piece of wastestock. The jardiniere then is mounted on the faceplate of the lathe and the inside is turned out as in the photo. The wastestock is turned off and the surface of the maple bands is smoothed. Sand and finish with three coats of varnish.

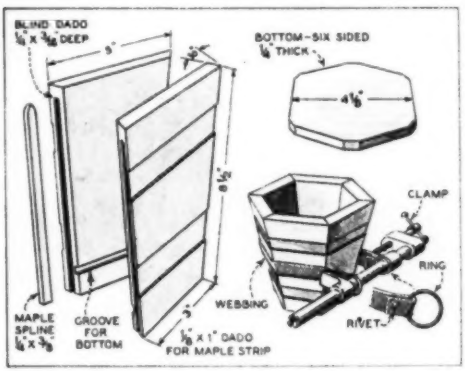


Jardiniere is handsome piece for sunporch.

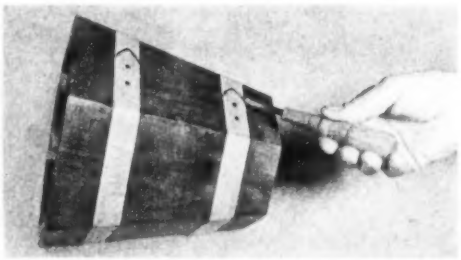
Making the dadoes for the maple inserts.

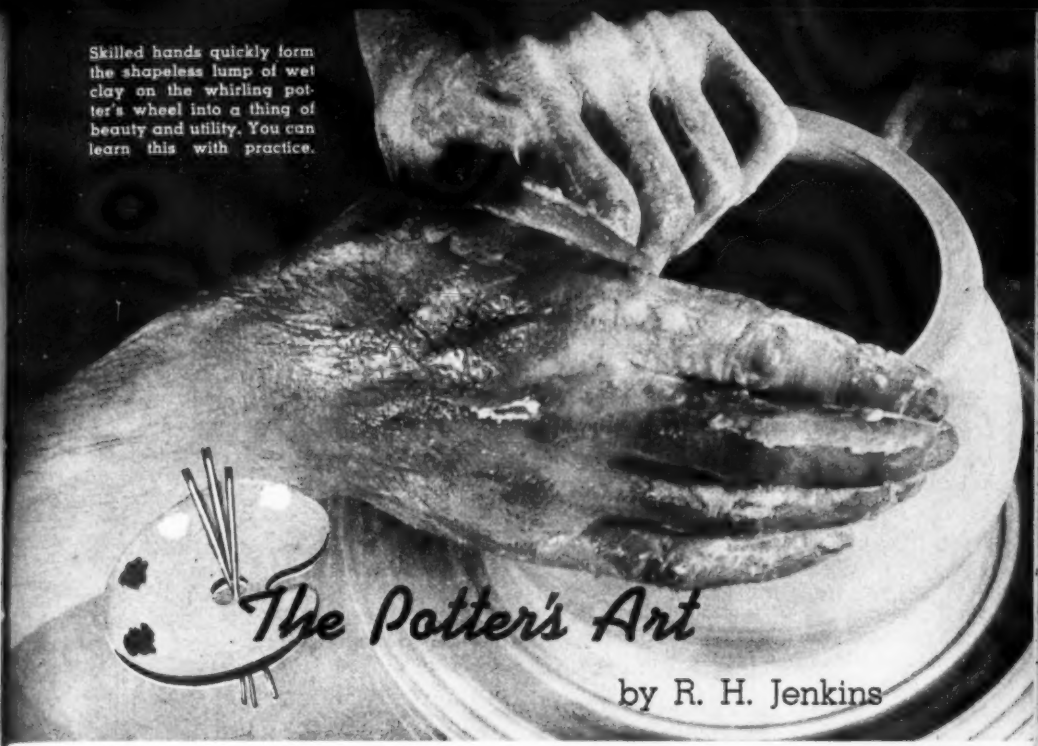


Parts for assembly. Turning (below).



Burn in design with heated screw driver.





Skilled hands quickly form the shapeless lump of wet clay on the whirling potter's wheel into a thing of beauty and utility. You can learn this with practice.

The Potter's Art

by R. H. Jenkins

BLACK STAR

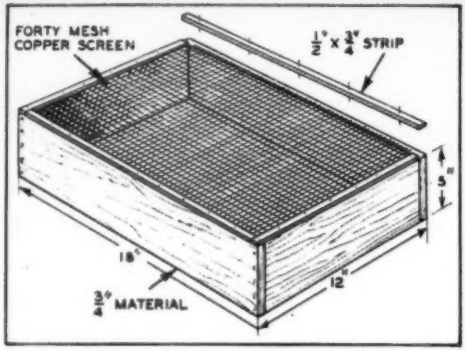
First of a series on pottery making at home by an authority in the field, author of "Practical Pottery for Craftsmen and Students" and ceramics instructor at Humboldt State College, Arcata, California. You'll find it easy and fun.

PART I

POTTERY is an age old art. Its origin is buried, along with many of its more material manifestations which have been dug up by archaeologists, in the shadows of the past. In one respect, however, the art of pottery can be called truly ultra-modern, and the war has brought out this fact by means of science's latest and most prideful upstart—plastics, first cousin to pottery, eight thousand years removed! For pottery is not only cousin but also ancestor of plastics, and the humble clay from which it takes shape is nature's timeless answer to Nylon and Plexiglas. The inherent plasticity of clay is what has made it a fascinating working material for every race and era of people, from the Babylonians with their baked clay libraries, to the 1944 California roadside potter displaying his colorful tableware.

Today's scarcity of metal and lumber, and long priority lists in numerous categories have brought pottery back to the home workshop with (pardon pun) a crash; the amateur craftsman can turn his hand to this interesting work with beautiful useful results. Priorities

Glazed and fired pottery is the ultimate in appearance and durability. With experience you can make it.



Screening box for clay is simple affair made as above.

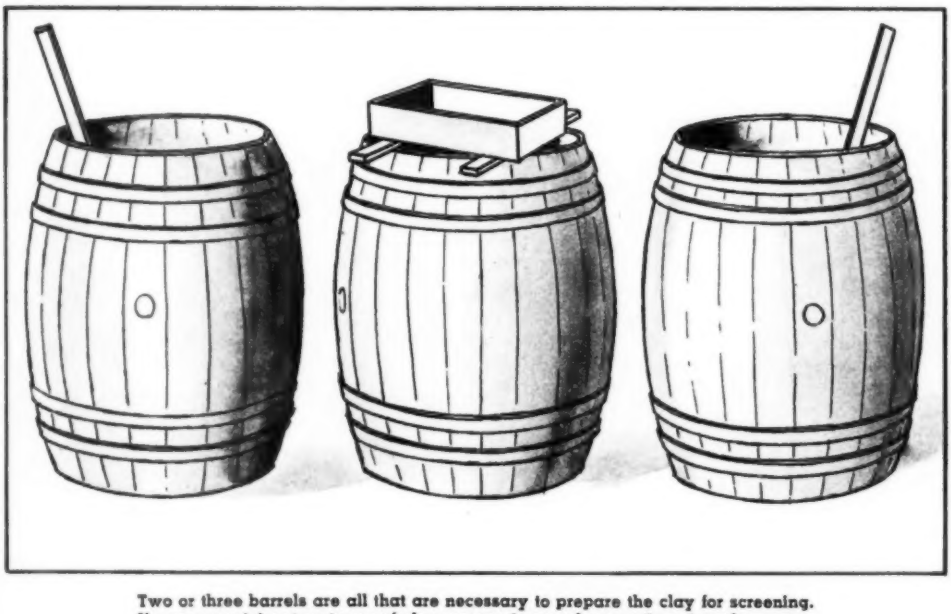
don't enter this picture at all. Cash layout is negligible. Equipment needed is very simple, and you can have fun making it yourself from scrap—plans for a simple wedging table and pottery wheel will be given herewith. If the particular model of the latter shown doesn't please you, take a trip to the public library and look up another one—the Egyptians were using virtually the same job in the year 4,000 B.C., so you'll undoubtedly find something suitable somewhere in between.

Like primitive man, the craftsman can develop a latent skill and gain a great deal of pleasure even if he is not able to glaze his ware. Early man first used his pieces without firing as storage receptacles, but not being satisfied, discovered the simple art of firing; in a similar step-by-step manner the beginner can develop his field.

Procuring The Clay

Clay finely pulverized and ready for use can be purchased from almost any store selling building supplies. However, half the pleasure is lost if the beginner doesn't, if possible, dig his own clay. To get out into the country and locate one's own favorite deposit gives a thrill which should not be missed. The clay may be discovered in the bed of a running stream, or in the bank along the edge; in a cut of the highway, or in the bottom of an excavation.

For ordinary pottery work the color of the clay will make little difference. White clay will usually stand a greater heat than the dark variety as the minerals causing the color are likely to have a fluxing effect. If glazing is not in the plan a firing test will not need to be had. However, if you are glaze ambitious, have a sample fired and tested with some standard glaze, as some clays will not take a glaze at all.



Two or three barrels are all that are necessary to prepare the clay for screening. If you are mixing two types of clay, screen in equal proportions into the center. barrel. Note two strips of wood across top of barrel to hold screening box.

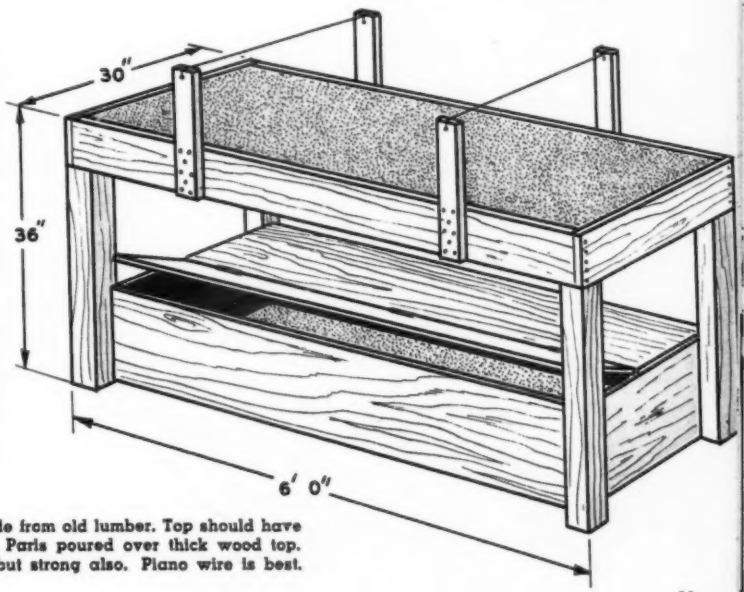
The bed of the clay should be tested for plasticity, texture, etc. The top of the strata may be found better than the bottom. If two beds are found it may be well to mix them. Over-plastic clay is hard to throw, and a too short clay is just as bad in the other extreme. A happy medium grade is the most desirable. If there is only one bed, and that is very plastic, a little plain earth can be added, or some commercial clay. Some like to use finely pulverized brick, known as grog, to temper their clay.

Dig a large enough supply to last for several months, and put the clay away in sheds to dry. When dry, drop in barrels of water and let stand for twelve hours, or until the clay is all dissolved. Now if the clay has been carefully chosen, so as to be free from sand, roots, and rocks it can be dipped out upon a board to stiffen. If gravel is present, the clay will have to be screened. As was previously stated, clay may be improved if two beds can be used. In this event the same screening process is employed. Two or three barrels are required, depending on whether you are screening for a mixture of two clays, or just for gravel, or both, for that matter. Make a box from boards measuring ¾"x5"x18" and ¾"x5"x12", with a bottom of 40 mesh copper or iron screen. (See sketch.) Fasten screen in place with a strip of thin wood so the weight of the clay will not pull the wire off.

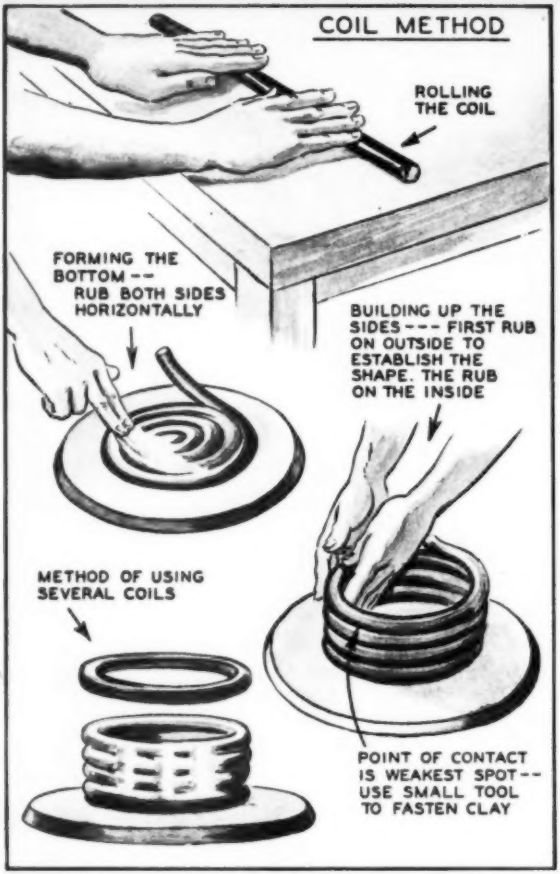
After the dry clay has stood overnight, mixed with water, it should be stirred into a creamy state. This mixture, called *slurry* before screening and *slip* afterwards, is screened into the empty barrel, using equal parts of the two kinds of clay if an admixture is being made. Use plenty of water as the slurry will pass through the screen much more easily if well saturated. Let the resulting slip stand and settle, and as it settles dip off the surplus water until the mass becomes heavy and thick. Slip, like wine, improves with age and should be left for several weeks before using, if possible. It must be stirred every few days to prevent lumps from forming.

A little care in choosing and preparing the clay will insure the success of the finished products. Follow directions carefully.

Wedging is final preparation of clay before throwing on wheel. Lump of clay is split repeatedly by wire when slammed on wedging table. This softens it.



Typical wedging table, made from old lumber. Top should have heavier layer of plaster of Paris poured over thick wood top. Cutting wire must be fine but strong also. Piano wire is best.


COIL METHOD
ROLLING THE COIL
FORMING THE BOTTOM -- RUB BOTH SIDES HORIZONTALLY
BUILDING UP THE SIDES --- FIRST RUB ON OUTSIDE TO ESTABLISH THE SHAPE. THE RUB ON THE INSIDE
METHOD OF USING SEVERAL COILS
POINT OF CONTACT IS WEAKEST SPOT -- USE SMALL TOOL TO FASTEN CLAY

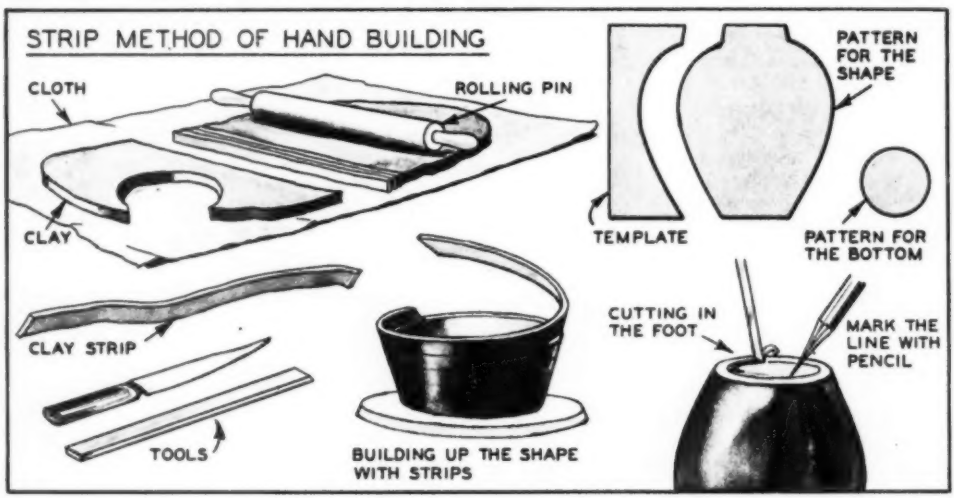
Building by the coil method (above) and strip method (below). Main thing to watch in the coil method is perfect adhesion.

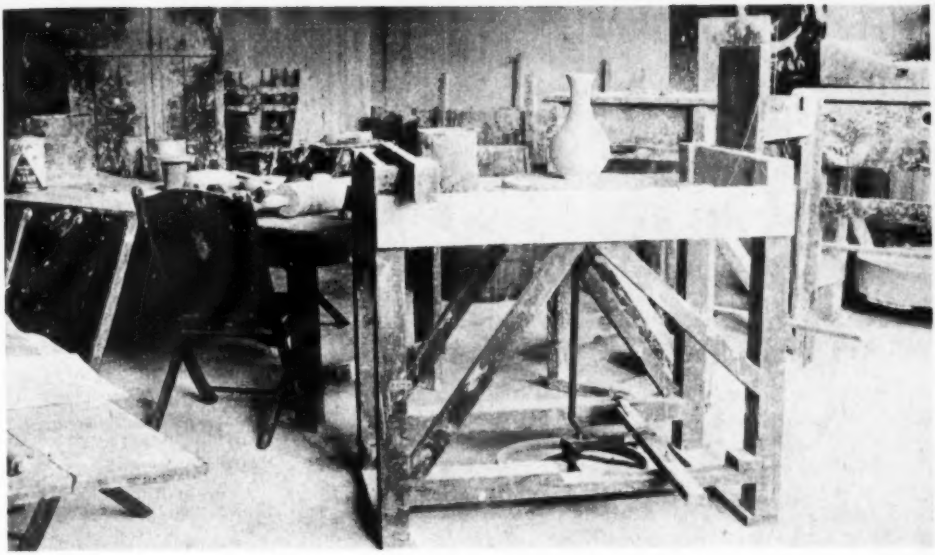
Ball of clay is centered after being thrown upon wheel. Note wide, sturdy clay base.

Wedging Of The Clay

When the clay has stiffened in the barrel or on the boards, take a lump about the size of a loaf of bread and wedge it upon the wedging table. The wedging consists of cutting the clay on a wire and then slamming the mass down violently upon the table. Continue to cut or beat until the whole lump is smooth and of even consistency. The cutting will help to remove any possible remaining stray material in the clay and also aids in mixing the mass to uniform consistency. Clay needs to be thoroughly wedged at all times but especially so when it is to be thrown upon the wheel.

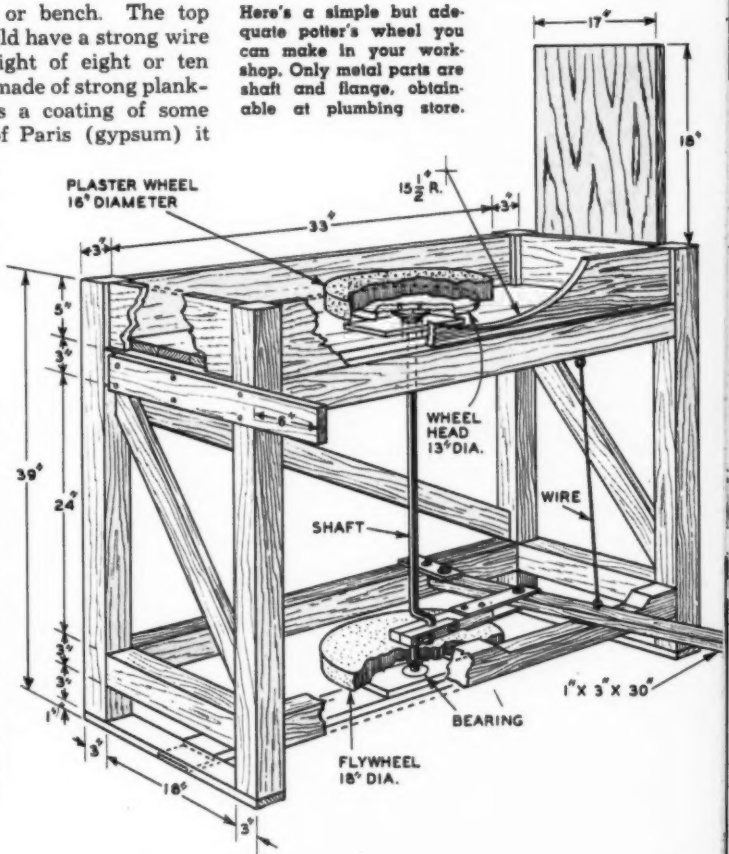
The wedging table may be made





from any strong table or bench. The top should be solid and should have a strong wire strung over it at a height of eight or ten inches. This top can be made of strong planking alone, but if it has a coating of some two inches of plaster of Paris (gypsum) it will work still better. Mix the plaster of Paris at the rate of about three pounds to one quart of water. Clay will not stick for long to the plaster.

Here's a simple but adequate potter's wheel you can make in your workshop. Only metal parts are shaft and flange, obtainable at plumbing store.



Hand Building

The simplest process of making pottery is that of building by hand, so probably a piece or two should be made by this method at first, even though other processes are more interesting. There are two ways to be considered in building by hand, the coil method and the strip method. The coil system is as old as pottery itself. It consists of rolling coils of clay

[*Continued on page* 134]

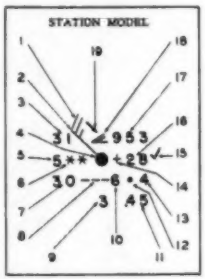
THE SCHOOL SHOP

Conducted by Gilbert Paust

Lieutenant, Civil Air Patrol, Westchester Squadron

Chapter 17—Weather Reports and Forecasts

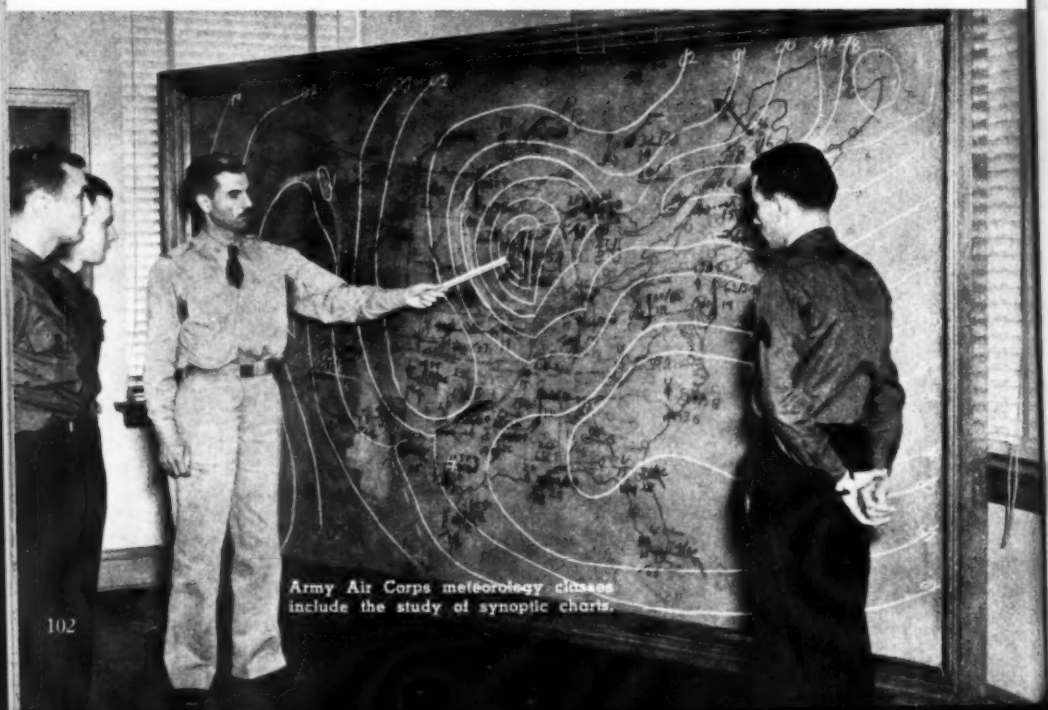
WEATHER forecasting really has become a science. The meteorologist who today charts the weather along our civil airways, or who gives his consent to the flights of our huge fighting planes into the heart of Europe, is a far cry from the lad with the long, gray beard who gazed into his crystal ball to discover if rain or shine would be on the weather menu for the next day. A corn on a big toe is no longer considered a means of forecasting rain, and leaves of a tree turning over on their backs do not necessarily mean that a thunderstorm is on the way.



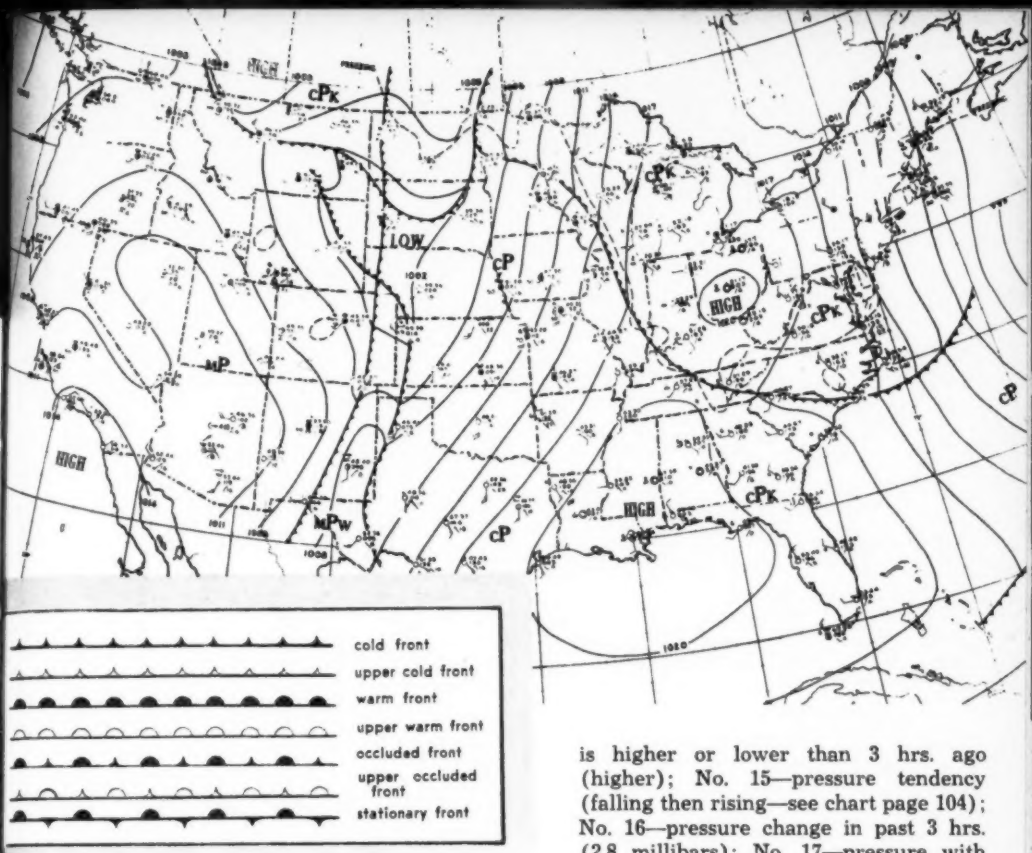
Symbols for this model explained in the text.

The modern forecaster attacks his problem much more intelligently and scientifically. First he assembles all the weather data of his own and the surrounding areas. Then, knowing the characteristics of air masses, fronts, high and low pressure areas, etc., and ascertaining the direction in which the weather is moving, he determines carefully weather tendencies and from these the weather to come. Let's find out, first of all, how he procures his information concerning existing atmospheric conditions.

Weather reports for the United States are gathered from a great number of stations throughout the country and are recorded on a *synoptic weather map* (page 103). The reports are made at 6-hour intervals four times a day, beginning at 1:30 a. m. E.S.T. They are collected at forecast centers by radio, telephone,



Army Air Corps meteorology classes include the study of synoptic charts.



International front symbols frequently are used instead of colors on weather maps.

telegraph and teletype. At weather stations on the airways, observations are made every hour. In order to conserve space on the synoptic map, most data is recorded in the form of symbols which are grouped in a circle about the station. Such a station model, with the position of the symbols, is shown on page 102: No. 1—barbs showing wind velocity (19-24 m.p.h.); No. 2—Beaufort wind arrow (NW wind); No. 3—temperature (31° F.); No. 4—sky cover (overcast—see chart page 104); No. 5—visibility (1¼ to 2½ miles—see code chart page 105); No. 6—weather (snow); No. 7—dew point (30° F.); No. 8—low clouds (broken cumulus); No. 9—height of low clouds (656 to 983 ft.—see code chart page 105); No. 10—amount of clouds (9/10 covered—see code chart page 105); No. 11—precipitation in last 6 hrs. (.45 inches); No. 12—past weather (rain); No. 13—time of precipitation (4 hrs. ago); No. 14—plus or minus sign to show whether pressure is higher or lower than 3 hrs. ago (higher); No. 15—pressure tendency (falling then rising—see chart page 104); No. 16—pressure change in past 3 hrs. (2.8 millibars); No. 17—pressure with first 9 or 10 for hundreds, and decimal point, omitted (995.3 millibars); No. 18—middle cloud (altostratus); No. 19—direction of middle cloud (from NW). Many times, of course, much of this data is missing because clouds, rain, etc., don't always exist and, therefore, you will find few station models as complete as the one described.

Besides the weather stations and their data, each map includes the isobars previously mentioned. These are drawn in black for intervals of three millibars. When an isobar ends at the margin of the map, its value in millibars is placed near it in the margin. When an isobar forms a continuous line, the line is broken at one point and the value inserted.

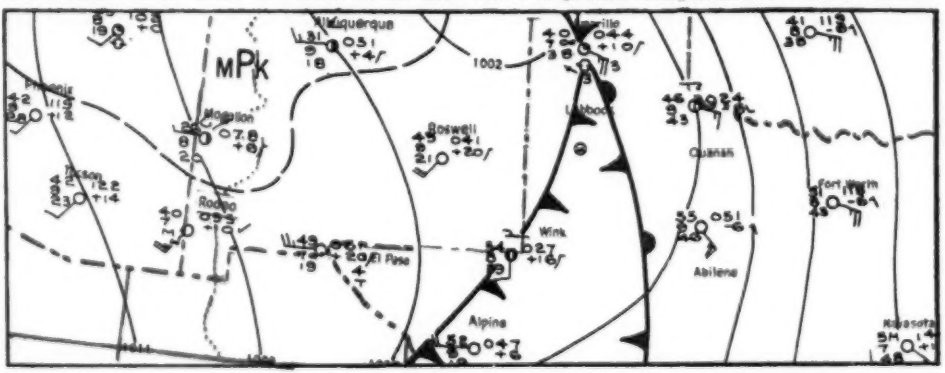
On some maps, *isotherms* are recorded, also. These are lines, drawn in light blue, connecting points having the same temperature. The one most often used is the isotherm for freezing (32° F.).

Fronts are indicated by lines drawn between the two air masses. For fronts near the ground, heavy blue lines are used for cold

Sky Cover		Pressure Tendency	
Absolutely no clouds	Seven- or eight-tenths	Rising, then falling	Falling, then rising
Less than one-tenth	Nine-tenths	Rising, then steady	Falling, then steady
One-tenth	More than nine-tenths but with openings	Rising unsteadily	Unsteadily falling
Two- or three-tenths	Sky completely covered with clouds	Rising steadily	Falling steadily
Four-, five, or six-tenths	Sky obscured by fog, duststorm, or other phenomenon	Falling, then rising	Steady or rising, then falling

fronts, red for warm fronts and purple for occluded fronts. Broken lines of corresponding colors indicate upper air fronts. When colors are not used, the International front symbols are employed. In this system a cold front is shown by a curved line with dark points projecting from its forward side at regular intervals, a warm front by a similar

This synoptic chart section is almost actual size. Use it to practice interpretation of data at stations.



line with dark semi-circles instead of points, and an occluded front by a line with alternating points and semi-circles (page 103).

Areas of precipitation usually are drawn in green, with continuous shading for continuous rain and hatch marks for intermittent rain. Without color, a dark shading alone is used. Showers are shown by shower weather signs and drizzle by drizzle weather signs. Cold air mass abbreviations are in blue and warm in red—black on other maps.

Another type of map which the forecaster uses to good advantage is the *winds aloft map*. This map shows by means of arrows the wind direction at various altitudes above the earth's surface and are issued four times a day. The arrows are not the Beaufort arrows, however; velocities are shown not by barbs but by numerals near each arrow. The levels shown on the maps are: surface, 2,000, 4,000, 6,000, 8,000 10,000 12,000 and 14,000 ft. From them the most favorable altitude for flight can be determined and also the direction of motion of fronts since a front moves with the wind at 2,000 or 4,000 ft.

Airway *regional* and *terminal* weather forecasts are issued every 6 hrs. for periods of 8 hrs. in advance. Their time of issue is 5:30 and 11:30 a. m. and p. m. E.S.T. Regional forecasts are for areas including a number of airways, whereas terminal forecasts state the weather conditions expected at the various important airports. In addition to these two types, a *trip* forecast, referring to a particular route chosen by the pilot, is supplied to him upon request. Regional and trip forecasts contain the following information:

1. area or route
2. date, and time period covered by the forecast
3. synopsis (fronts and air masses)
4. clouds and weather
5. turbulence
6. icing
7. wind aloft
8. further outlook (approximate forecast for later periods)

The pilot himself has an important function in weather reporting

It is his duty to report back to his operations office the [*Continued on page* 136]

Code figure	Height of lower clouds in feet
0	0 to 163.
1	164 to 327.
2	328 to 655.
3	656 to 983.
4	984 to 1,967.
5	1,968 to 3,280.
6	3,281 to 4,920.
7	4,921 to 6,561.
8	6,562 to 8,201.
9	Above 8,202, or no clouds.

Code fig. 3 is used in model (p. 102).

Code figure	Time precipitation began or ended
0	No precipitation.
1	1 hour ago.
2	2 hours ago.
3	3 hours ago.
4	4 hours ago.
5	5 hours ago.
6	6 hours ago.
7	7 hours ago.
8	more than 12 hours ago.
9	Unknown.

Precipitation time: code fig. 4 in model.

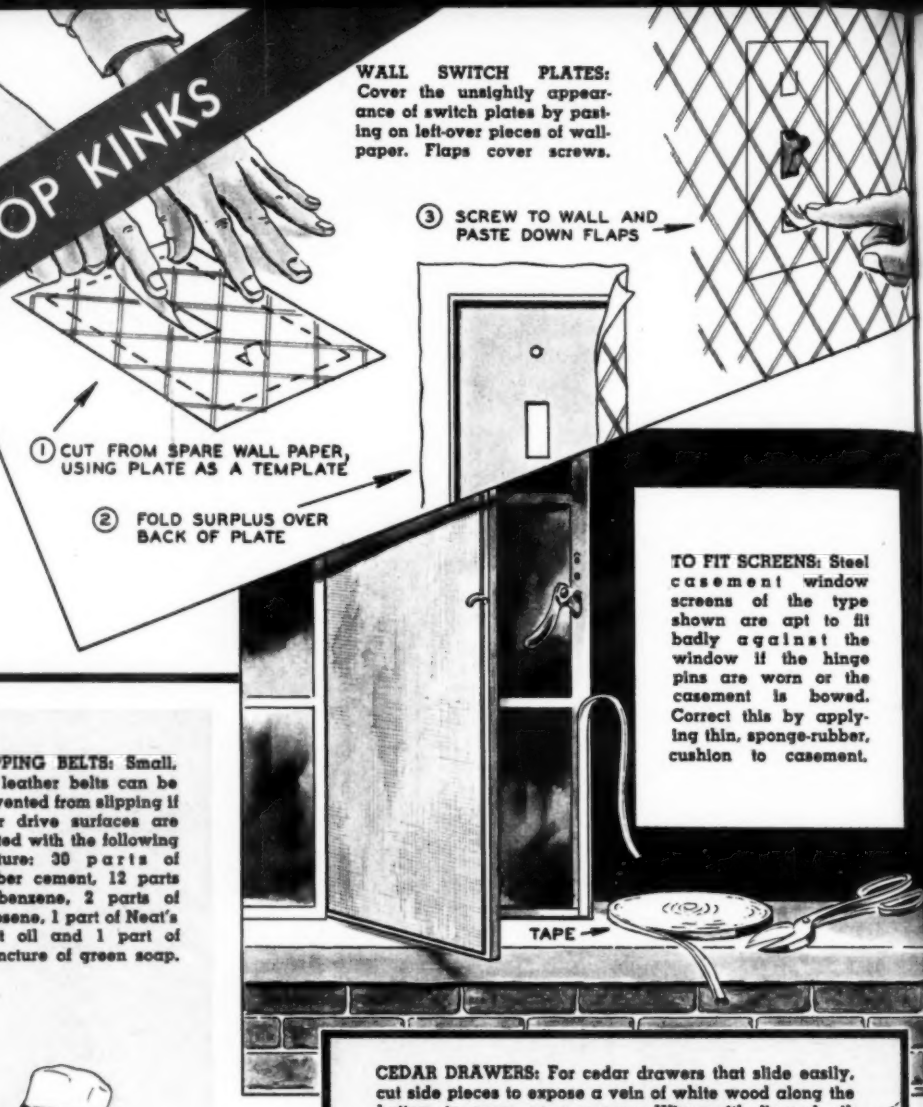
Code figure	Visibility in miles	
	Objects are visible at—	Objects *not* visible at—
0	.....	$\frac{1}{16}$ (55 yards).
1	$\frac{1}{16}$ (55 yards).	$\frac{1}{8}$ (220 yards).
2	$\frac{1}{8}$ (220 yards).	$\frac{1}{16}$ (550 yards).
3	$\frac{1}{16}$ (550 yards).	$\frac{5}{8}$ (1,100 yards).
4	$\frac{5}{8}$ (1,100 yards).	$1\frac{1}{4}$ (2,200 yards).
5	$1\frac{1}{4}$ (2,200 yards).	$2\frac{1}{2}$ miles.
6	$2\frac{1}{2}$ miles.	6 miles.
7	6 miles.	12 miles.
8	12 miles.	30 miles.
9	30 miles.	

Visibility and cloud charts. Compare with p. 102.

Code figure	Amount of Lower Clouds
0	Absolutely no clouds.
1	Less than one-tenth.
2	One-tenth.
3	Two- or three-tenths.
4	Four-, five- or six-tenths.
5	Seven- or eight-tenths.
6	Nine-tenths.
7	More than nine-tenths, but with openings.
8	Sky completely covered with clouds.
9	Sky obscured by fog, dust storm, or other phenomenon.

SHOP KINKS

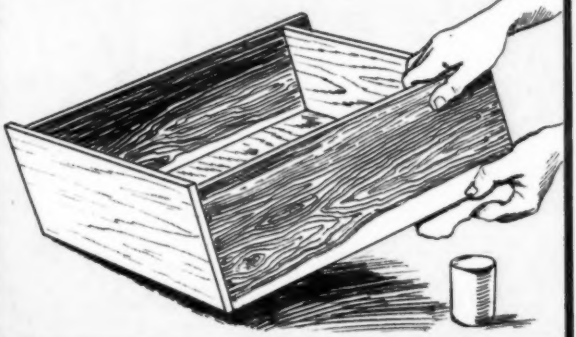
WALL SWITCH PLATES: Cover the unsightly appearance of switch plates by pasting on left-over pieces of wallpaper. Flaps cover screws.


③ SCREW TO WALL AND PASTE DOWN FLAPS
① CUT FROM SPARE WALL PAPER, USING PLATE AS A TEMPLATE
② FOLD SURPLUS OVER BACK OF PLATE
TAPE

TO FIT SCREENS: Steel casement window screens of the type shown are apt to fit badly against the window if the hinge pins are worn or the casement is bowed. Correct this by applying thin, sponge-rubber, cushion to casement.

SLIPPING BELTS: Small, flat leather belts can be prevented from slipping if their drive surfaces are coated with the following mixture: 30 parts of rubber cement, 12 parts of benzene, 2 parts of kerosene, 1 part of Neat's Foot oil and 1 part of a tincture of green soap.

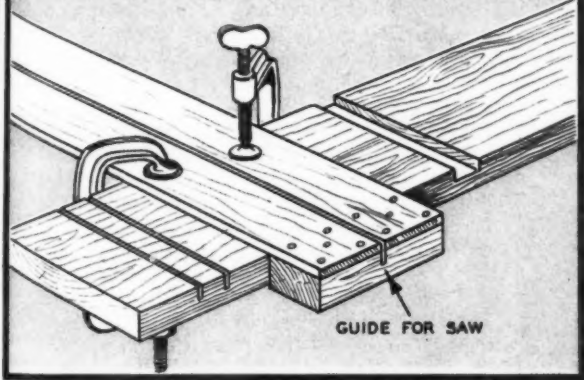
CEDAR DRAWERS: For cedar drawers that slide easily, cut side pieces to expose a vein of white wood along the bottom to serve as a runner. Wipe with linseed oil.

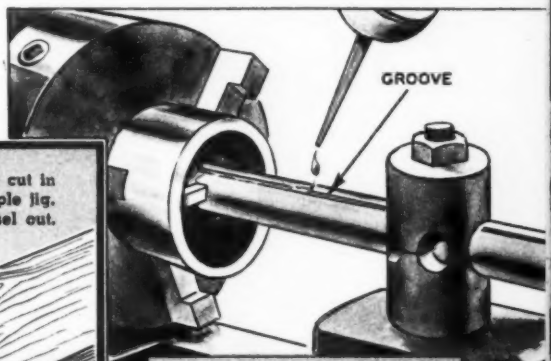


FURNITURE REPAIRS: When making furniture repairs on ordinary, painted chairs and tables, choose wood which is strong enough for the job and is easy to work. Beech and whitewood are fine for carved members such as chair arms. Seat patches can be shaped readily from whitewood or clear, white pine, the two woods commonly used for seats. Rails of pine will be sufficiently strong for bracing the legs of settees, small tables and stands, but where the rail must serve as a footrest, also, make it of hardwood. Use birch, maple or beech for making legs, rungs or other parts which must be turned on a lathe.

MAKE STEPS SAFE: Outdoor stone steps will be visible in the semi-darkness if risers are painted white as shown. This will lessen likelihood of fall.

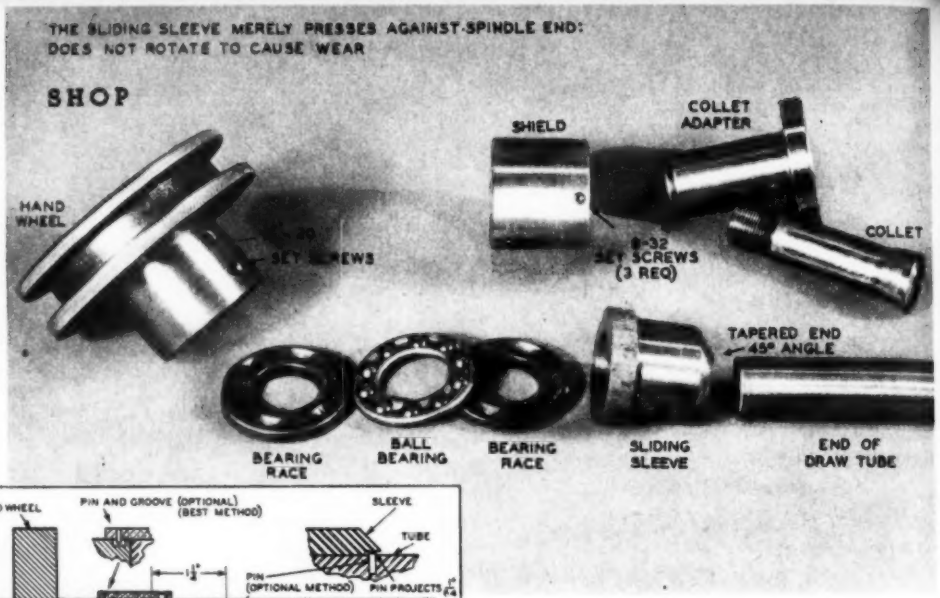
GUIDE FOR DADOES: Dadoes and rabbets can be cut in wide boards by means of a handsaw and this simple jig. Clamp in place to guide saw; make cuts and chisel out.

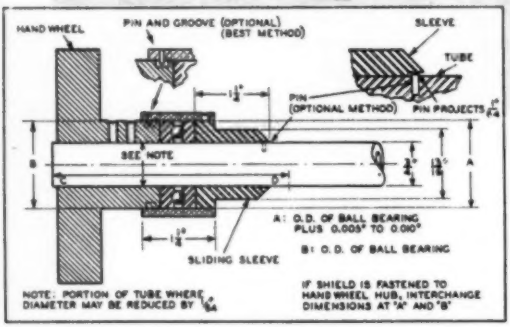




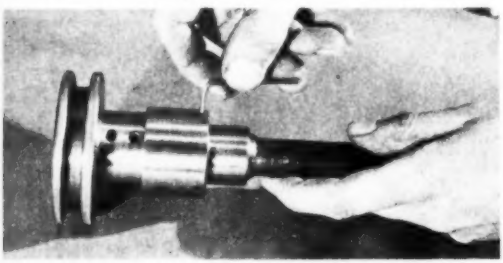
OIL GROOVE FOR BORING BAR: When lathe-boring small and deep holes, or cutting internal threads, a boring bar with an oil groove will save much grief; set tool to slope downward.

REYNOLD C. ANDERSON

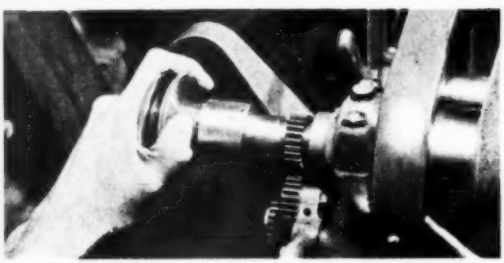



HAND WHEEL
PIN AND GROOVE (OPTIONAL) (BEST METHOD)
SLEEVE
TUBE
PIN (OPTIONAL METHOD)
PIN PROJECTS
SEE NOTE
A: O.D. OF BALL BEARING PLUS 0.005" TO 0.010"
B: O.D. OF BALL BEARING
SLIDING SLEEVE
NOTE: PORTION OF TUBE WHERE DIAMETER MAY BE REDUCED BY
IF SHIELD IS FASTENED TO HANDWHEEL HUB, INTERCHANGE DIMENSIONS AT "A" AND "B"

Above are the parts and dimensions of draw tube.



Tightening the set screw in dirt shield of tube.



In use, sliding collar fits against end of lathe spindle, tapered end of collar centering on bore.

COLLET DRAW TUBE

COLLETS on a lathe or other machine tool are easily locked or loosened when a ball thrust bearing is used between the spindle and handwheel. The photographs show a draw-tube assembly, machined from scrap parts, that was made for a 9" bench lathe.

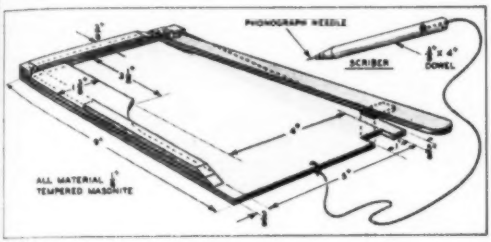
The draw tube is ½" inside diameter, ¾" outside diameter, and long enough so that, when in position in the spindle, it projects 4" or so. It is internally threaded at one end to fit the collets. At the outer end of the tube, held by two ¼"-20 hollow-head set screws, is the handwheel which, in this case, was made from an old pulley: a wheel 6" or more in diameter and having a rounded, smooth rim would be better. Next to the outer end of the lathe spindle is a sleeve having one end tapered to an angle of about 45° so that it will tend to center itself against the end of the spindle bore. The other end of the sleeve has a diameter about 1/64" larger than the diameter of the thrust bearing. The sleeve must slide and rotate freely on the draw tube: it is advisable to turn down the tube diameter slightly at the outer end, or provide a pin at the tapered end, to prevent the sleeve from dropping off when the tube is removed.

Between the [*Continued on page* 136]

Cutting Board And Scriber

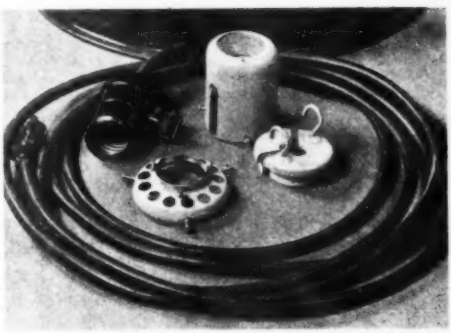
THIS device is not only a handy gadget for the workshop, but can be used in your darkroom for trimming film. Alter size to fit your needs.

Make of ⅛" composition board, the base requiring a piece 6"x9". Fasten the corner strips to the base with glue and either ⅜" wood screws or brads. The trimming-guide bar is hinged to the edge strip at the top and has a small block for alignment fastened to the under side, fitting in a notch cut in the base. Scriber is made of dowel with phonographic needle in end.

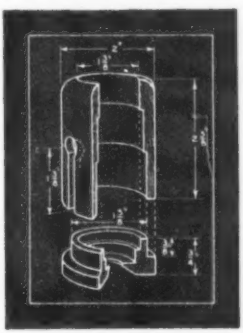


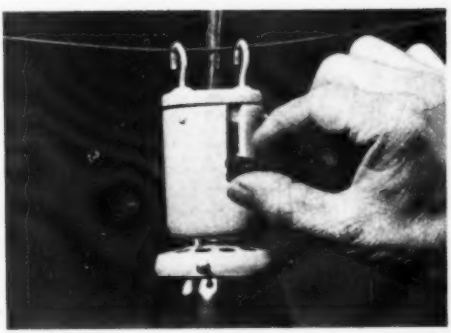
Protector For Light Socket

PRESENT-DAY bakelite light sockets are inexpensive but rather fragile for shop use. By making a wooden shell, however, such a socket becomes a unit that is shock-proof and easily suspended. The sketch gives dimensions for one common type of socket, but may be modified for other types. Use hardwood for the shell and bore it on the lathe or with an expanding bit and brace. Make the cap to slip inside the large end and over the socket cap. Cut out a section to allow it to go over the wired socket, and secure it with three small round-head wood screws through the shell. Use a screw-type reflector adaptor, drilling three holes to allow screws to be entered in the lower end of the shell.



Hang by screw hooks.





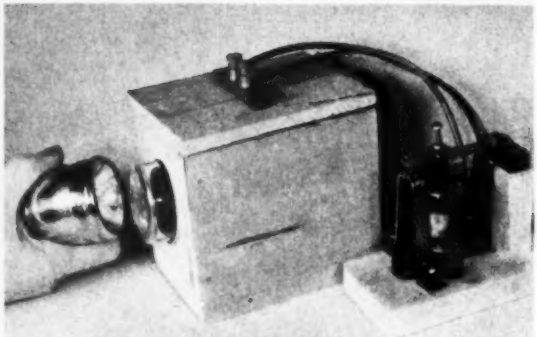
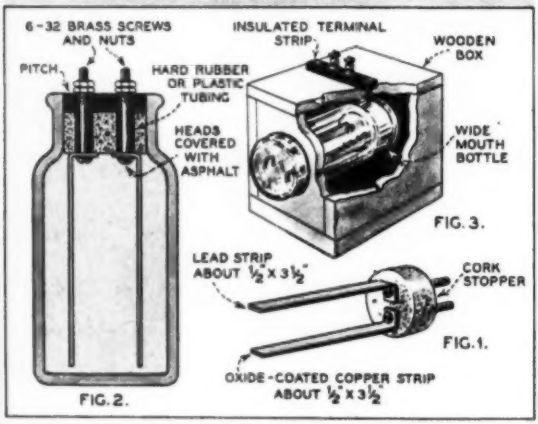
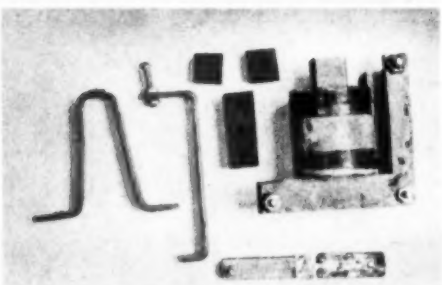
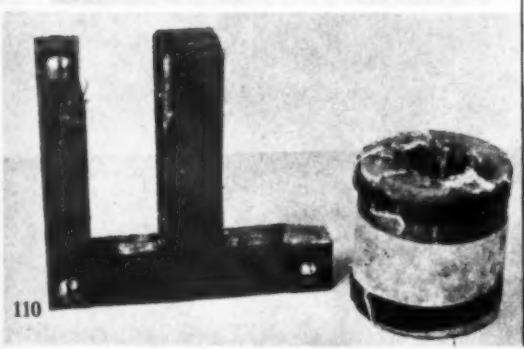


PHOTO ELECTRIC RELAY



Flashlight will operate cell and trip relay (top). Follow drawing for cell construction and insulation.





This device is sensitive and reliable. Parts which you can't find in your radio box you can buy very cheaply.

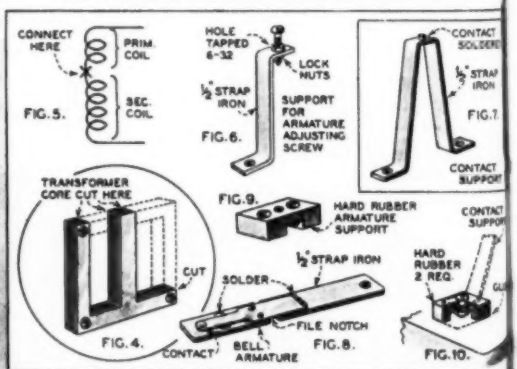
by Raymond Yates

THE ordinary relay is nothing more than an electrical switch; it operates on a very small amount of current and either "makes" or "breaks" an external circuit which has a much larger power source and feeds the working motor or other electrical gadget. This one is the photoelectric type. It can be made to perform by flashlight, matchlight, or simply by waving your hand.

Before beginning the construction of the relay, remember not to take any liberties with the suggested forms of insulation. Photocells of any type generate very little current and every effort must be made to prevent its wasteful leakage.

Special attention must be given the matter of insulation where the terminals of the cell pass through the cork of the bottle. (See Fig. 2.) Otherwise so much leakage will take place here that the cell

The relay is made from an old audio transformer cut as shown; armature is from bell or buzzer.



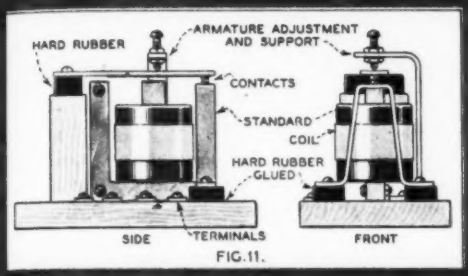
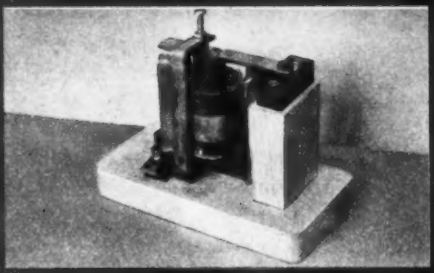
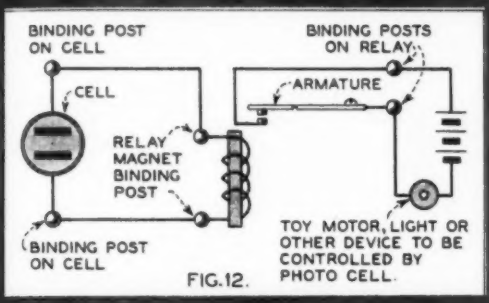
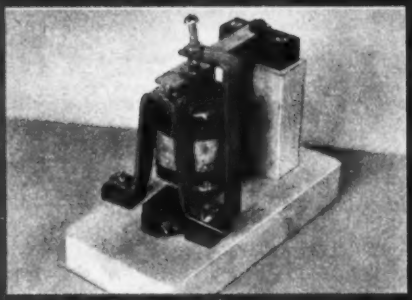


FIG.11.



Here is finished relay. Bolt and two nuts through support are used to adjust contact spacing of armature.


BINDING POST ON CELL
BINDING POSTS ON RELAY
CELL
ARMATURE
RELAY MAGNET BINDING POST
BINDING POST ON CELL
TOY MOTOR, LIGHT OR OTHER DEVICE TO BE CONTROLLED BY PHOTO CELL
FIG.12.



This simple hookup can be used to throw in outside power source for running small motors or ringing bells.

will not deliver enough current to operate the relay. It also is important that the cork be pressed down below the lip of the bottle mouth and the resulting depression be sealed with pitch. The bottle itself should have a mouth at least 1″ in diameter, and a rubber stopper will be much better than one of cork if such can be found.

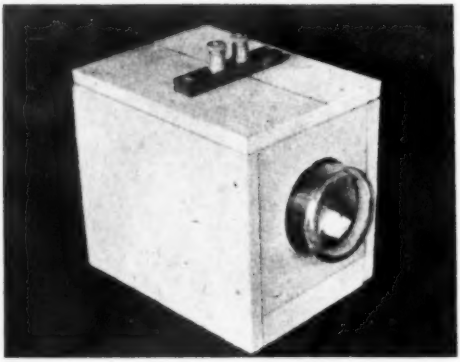
Another thing: no dimensions are given on the accompanying drawings because the dimensions are not critical. Such dimensions, in the case of the cell itself, will depend upon the size of the wide-mouthed bottle employed and, in the case of the relay, will depend upon the size of the core taken from an old audio radio transformer.

In construction, one lead electrode is employed, and this may be cut from a sheet of the metal, the gage being quite immaterial so long as it is thick enough to hold its shape. The other electrode is made of copper, and it will be necessary to treat this to give it a film of Cu_2O (cuprous oxide). To do this, the copper is cleaned very carefully after having been cut to size, the cleaning being done with a fine grade of emery paper. The emery dust is wiped away, and then the copper electrode is placed in the flame of a blow-torch for about fifteen minutes until it becomes thoroughly encrusted with a layer of another oxide, CuO.

Those who have studied chemistry will readily understand what takes place when copper is exposed to a flame in this manner. Two forms of copper oxide will appear on the copper, the CuO being on top and the Cu_2O being on the bottom. In short, the coating of oxide which is valuable and which is light-sensitive lies underneath the CuO. Consequently, it will be necessary to remove this top layer either by mechanical means or by chemical means.

In the mechanical method, a piece of *fine* emery paper or cloth is used to remove the first layer, with just a light pressure on the emery cloth so that it will not cut too deeply. The worker will be able to recognize the layer of Cu_2O underneath the CuO because of the distinct color of the former. After the dull layer of CuO has been completely removed, the electrode may be washed in cold, clean water to remove any particles of emery that may have been left on the surface of the copper.

The chemical method depends upon immersing the copper electrode in a chemical



Mount cell in box to prevent damage and leakage.

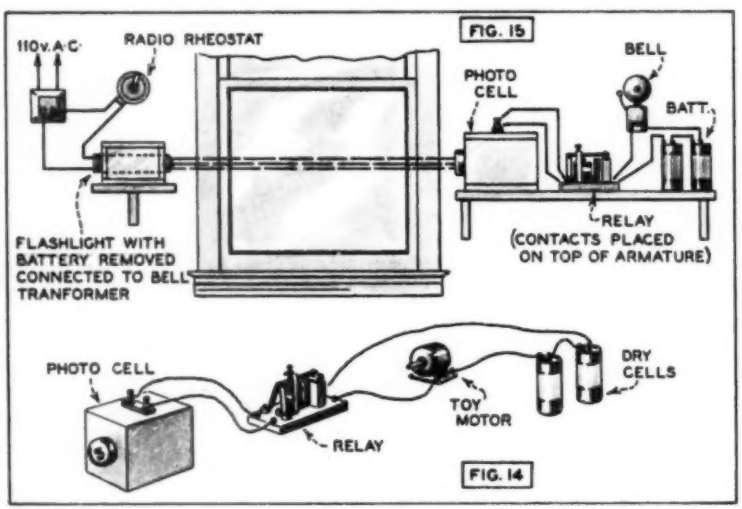
that will dissolve the outer layer of CuO. Nitric, sulphuric, or hydrochloric acid will accomplish this, and ammonia will serve the purpose also. Be careful when using them, however, and after removal wash the metal thoroughly in cold, clean water. It will be found quite active from a photoelectric viewpoint either in the dry state or when immersed in a suitable chemical preparation. It operates best, however, in a wet cell, and for this reason another chemical preparation will have to be made to be placed in the cell or wide-mouthed bottle, and your local druggist can make it for you for a few pennies. It is a 1½% solution of lead nitrate in distilled water.

Mount the electrodes in place and pour the solution in the bottle. The bottle should not be filled; only enough solution should be used to cover the electrodes. The cork and electrodes then are pressed in place, and the hot pitch or asphaltum is poured over the top of the cork and allowed to set. Then the cell is ready for its first test.

Testing is done with a milliammeter, for such a cell should develop a current anywhere between one milliampere and ten milliamperes, depending upon how well the cell is made and how powerful the light is, as well as the distance between the light and the cell. When a 60-watt lamp is used 2′ away, a current of between one and two milliamperes should be developed. The builder is cautioned against mounting the outside terminals of the cell in the wood of the case. Leakage through any form of wood is excessive and the terminals should be mounted on a good insulator and protected from the wood in the manner illustrated.

The principal parts of the relay are taken from a door bell or buzzer and an old radio audio transformer with windings intact. This transformer may be of the shell type (as shown in Fig. 4) or of the ordinary closed core type. In any event, one leg of the transformer core must be cut away and the armature of the relay so mounted that it will serve to replace it. Thus is the magnetic circuit restored.

Usually the primary and secondary coils of such transformers are wound one over the other. Inasmuch as these coils are wound in the same direction, there is little reason why both should not be employed to energize the relay with the photoelectric current. Here



Burglar alarm system such as this is easily installed. Place contact above armature so when light beam is broken, armature will rise and complete the bell circuit. Motor circuit is shown in Fig. 14.

we need only determine where each winding begins and ends. Then the end of the primary winding is soldered to the beginning of the secondary winding as in Fig. 5.

The armature must be made far more sensitive to magnetic pull than it was on either the bell or buzzer from which it came; it will have to respond to perhaps 1/1000th of the current. In removing the armature from the bell or buzzer, it will be noted that the iron part has a phosphor spring riveted to it, and that this spring projects over the end of the iron portion of the armature and also is riveted to a standard. Thus the armature is permitted to vibrate because of the small section of free phosphor bronze between the end of the armature and the standard. This particular section of the phosphor bronze must be weakened and made more sensitive to magnetic pull by taking a small three-cornered file and filing a V almost three-quarters of the way through the bronze. Thus it will be made to flex or bend more easily.

Care also must be taken to see that the vital parts of the relay are insulated from the wooden base if such is used. This will not be necessary with bakelite or hard-rubber base. The contact standard and the armature should be insulated from direct contact with wood by the use of the little hard-rubber or bakelite pieces shown.

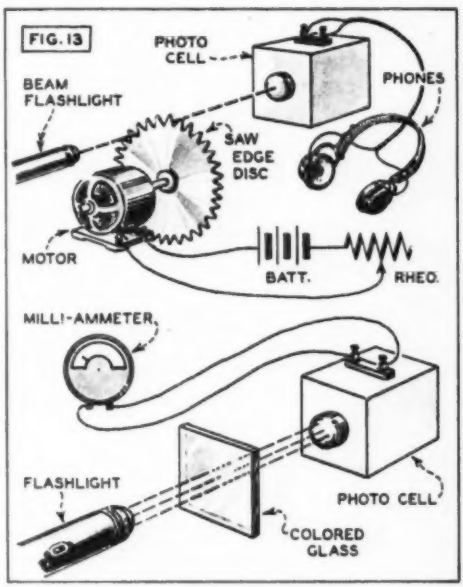
After the relay has been assembled, adjust the armature so that maximum sensitivity will be had. The armature is so arranged or bent when mounted that it will spring upward. The contact carried by it should be directly above the contact mounted on the standard and the separation should amount to only a few thousandths of an inch. When adjustment is made, it might be advisable to insert a small piece of newspaper between the contacts and then gently bring the armature down by means of the adjusting screw until the paper is slightly pinched, after which it is removed. There should then be a separation of the contacts amounting to about .004 inch.

Although such cells are not as fast in their response as are the vacuum type, they can be made to yield musical sounds with a chopper wheel as illustrated in Fig. 13. If a high-speed motor with a rheostat is used, a point in motor speed can be reached where the musical sound will become rather shrill and then pass out altogether. This makes an extremely fascinating experiment.

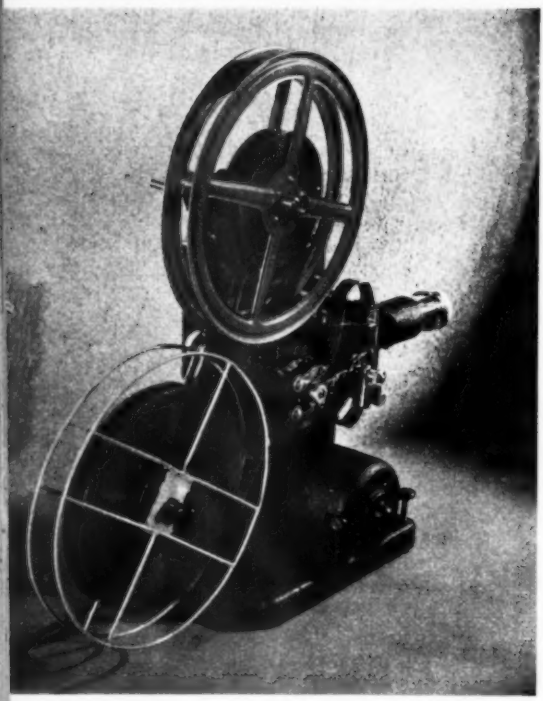
The use of various colored lights also supplies interesting data for experimenters. Such cells respond best to light in or near the ultraviolet. Radiations, for instance, from a home-made arc lamp cause maximum response. On the other hand, red light has practically no effect. Thus the user merely places pieces of colored glass between the light source and the cell to discover these things for himself. In any event, the milliammeter connected to the output of the cell will indicate lower current even with clear glass.

Another trick that will be sure to amaze and amuse our friends is that of starting a motor or lighting an electric bulb by striking a match. The electrical arrangement is shown in Fig. 14. The match will have to be held only one inch away from the cell and the relay will have to be adjusted.

A practical application of the photo-relay is illustrated in Fig. 15 where a burglar-alarm installation is shown. The beam is produced by a flashlight without a battery and the lamp is lighted by means of a bell transformer and rheostat arranged to provide only three volts. This arrangement calls for a slight modification of the sensitive relay because the armature of the regular relay normally would be down so long as the light was on the cell; thus the contact is arranged above the armature instead of below it.



Saw teeth breaking beam produce sounds when cell is connected to earphones. Cell also will reveal the light transmission qualities of colored glass pieces.



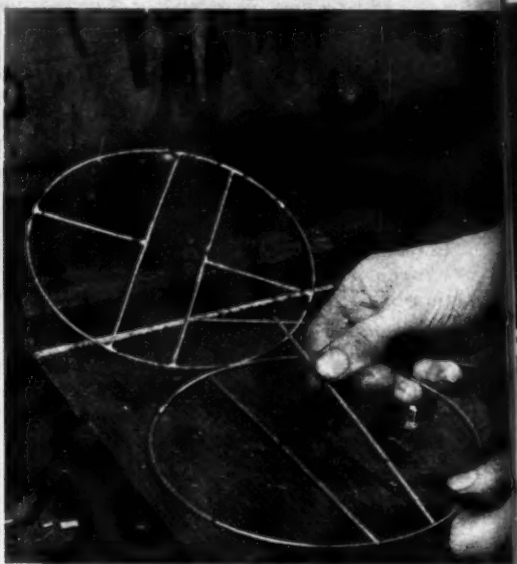
These wire reels are strong and easy to handle.

WIRE MOVIE

IF YOU are hampered by a shortage of reels for your motion-picture projector or editing outfit, you can make serviceable ones from wire such as that used for coat hangers. You will need, in addition, a strip of tin-can material or other sheet metal 5″ to 6″ long, and two small squares or rectangles of fairly heavy sheet metal for the hub plates.

The photographs show steps in making a reel for 400′ of 16-mm. film. First make two rings 7″ in diameter by bending the wire around a wooden disk or other form and brazing or soldering the ends together. While ordinary soft solder will do for fastening all the parts together, silver-soldering or brazing is better because of greater mechanical strength. A small blowtorch or acetylene torch may be used for heating. The illustrations show a ring form made by nailing a wooden disk to a board. A notch is cut in the disk and lined with sheet metal to provide working clearance for the torch. The ring rests on a half-dozen small brads driven into the disk edge.

Use notched wooden jig to form ring and braze joint.

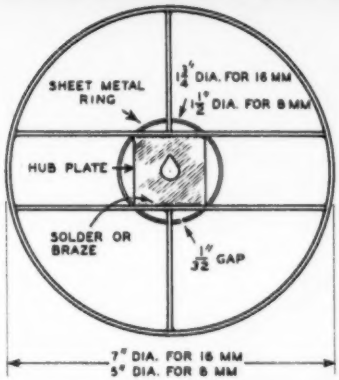


Brads driven in board hold spokes while soldering.

FILM REELS

Next run two parallel spokes across each ring, spacing them about 1⅜" apart and equidistant from the center. Insert two shorter spokes, about 2⅝" long, at right angles as shown. Brads driven into a board may be used to hold the spokes while you form the joints. Cut a strip of sheet metal long enough to bend into a circle about 1¾" in diameter. For a 16-mm. reel, the width of this strip should be approximately 43/64" (17mm.); for an 8-mm. reel, 23/64" (9 mm.). An 8-mm. reel, whose overall diameter is 5", has a ring 1½" in diameter at the center. Leave a gap of about 1/32" between the ends of the center ring so the end of the film can be slipped into it. Solder or braze the ring in the exact center of one of the spoke assemblies, and then join the second assembly to it. Take pains to align all parts of the reel so it will be reasonably perfect in shape.

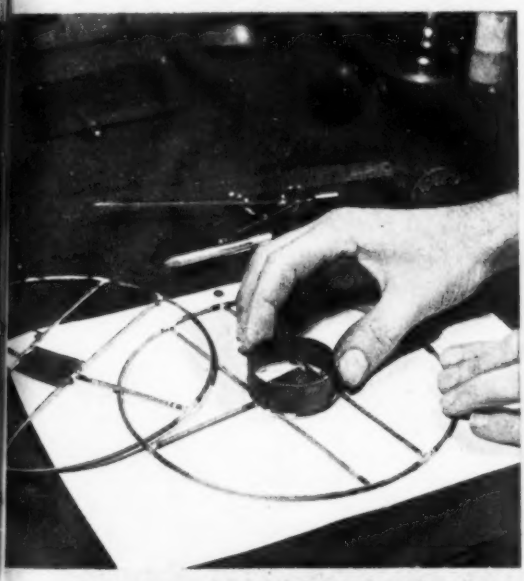
Cut two rectangular or square hub plates so they will fit snugly between the parallel spokes on each side of the reel, and fasten them securely to those spokes. With a compass determine the center of the reel by marking short arcs on one of the hub plates.



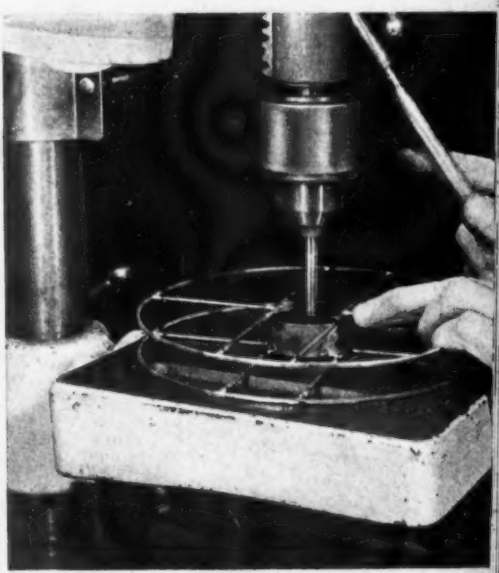
Reels may be made to take 16-mm. or 8-mm. film.

Make a punch mark, and drill squarely through both plates with a small bit, say a No. 40. Be sure you hold the bit exactly at right angles, or the reel will wobble. Now enlarge the two holes until they will permit the reel to be slipped over the reel spindles on your projector. File notches to fit the pins on the spindles.

To remove the brazing or soldering flux and prevent later corrosion, boil the reel for 10 minutes or so in water, and dry it thoroughly. If a greasy soldering flux was used, wash it off first [*Continued on page* 136]



Circles on paper aid in centering metal reel core.



Hold reel at right angles when drilling hub plates.

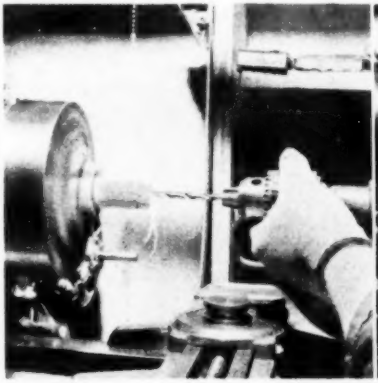
Here are three drill stands for three basic sizes: one in background holds a series of large drills on ½" shanks. That at left holds drills from 1/16" to ½". Folding metal affair holds number drills from 1 to 60.

DRILLING PLASTICS

by Josephine Von Miklos

THERE is no particular trick to drilling plastics, if one remembers a few basic facts. First of all, plastics are much softer than metal and while they are not quite as hard as some very hard woods, they have an entirely different texture, and are, at any rate, much harder than the common varieties of woods. Speaking of texture, we might say they have none. That is they have no grain like wood. They can break and split, but they won't fly into your face because you have inadvertently touched or cut into some hidden streak of grain. Secondly, plastics heat up under pressure or motion and have a way of becoming tacky that is disconcerting to everybody concerned, including the drill. Thirdly, if the drill burns the plastic, there is all sorts of trouble right around the corner, particularly if the piece has to be polished later. Ridges made by uneven drilling are

Whenever you intend drilling a large hole, it is good practice to start with a small drill first and gradually work up to the final sizes (in this case ¾").



The piece to be drilled is held in a universal chuck; we start with a small drill. The chips come out smoothly because of their small size.

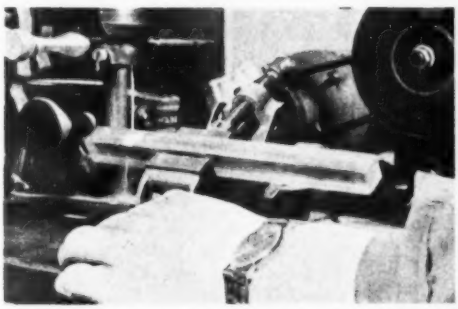
The chips are large now, wide bands of plastic material which flow from the hole. If these bands come out regularly, we are doing all right.

almost impossible to get out. For the same reason care should be taken that everything is in alignment, that nothing chatters and that the proper speed for drilling be found.

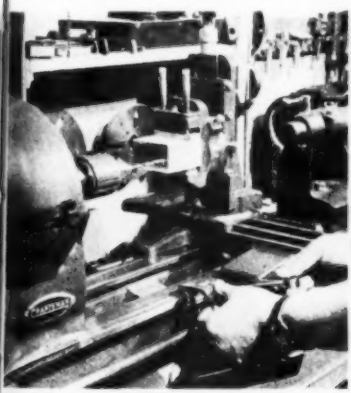
While all of this holds generally true for whatever plastic we are dealing with, there are different working reactions in various kinds of plastics. By and large the home work shop will probably deal with three types: cast resins like Catalin or Marblette, acrylics like Lucite or Plexiglass and cellulose acetate like Lumarith. Resins and acrylics are easier to work than cellulose acetate, they are less "gummy" and can be worked at greater speed. While any ordinary carbon drill will perform in any of these materials, Du Pont suggests the following specifications if perfect results are wanted: Flute angle . . . 17°; Lip angle . . . 70°; lip clearance angle . . . 4 to 8°. They also suggest a variation of speed from 7330 r.p.m. for a 1/16″ drill to 600 r.p.m. for a ¾″ drill. In other words, the larger the drill, the slower the speed, and that goes for lathe as well as drill press. It is important to withdraw the drill often so that the chips may be removed. It is also advisable to use a lubricant such as a mild soap solution, or, if you don't care about the looks of the piece you are drilling, oil.

As in every mechanical job, there may be only one perfect way of performing it, if you are a purist. But if you have to do a job with whatever equipment you have at hand, there is usually more than one way. You can drill a pretty good hole with an electric hand drill; but you'll have to be very much more careful about your angle and the rigidity of your surface than if you can use a lathe or a drill press. If you are [*Continued on page* 136]

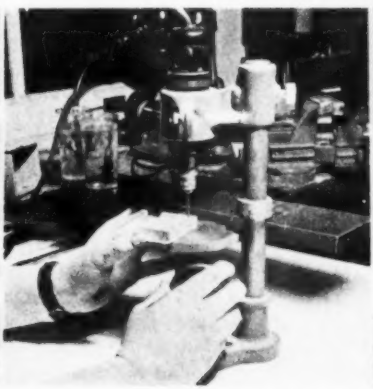
JOSEPHINE von MIKLOS, besides being one of the country's top women machinists, is an expert on plastics, designing cosmetic containers in this material for several large manufacturers. She has a well equipped workshop in her New York apartment where she makes accurate, full size models of her designs, using the same plastics which will be used in the finished product. Thus, she presents her clients with exact replicas of their proposed products, seldom has a rejection or criticism.



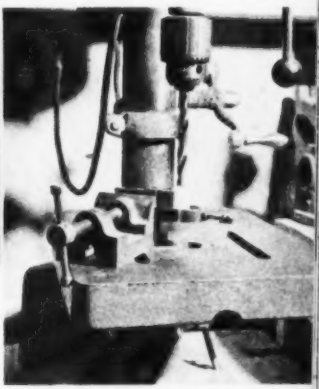
Here we are drilling a hole at a 45° angle. The angle vise is set, the work clamped on the drill press bed.



Drilling a series of holes in a block. Milling attachment holds work. Micrometer stop on lathe is set for uniform hole depth.



Here we use a Handee tool on a stand. This is a good way to drill small holes. A plastics drill has been selected with long, wide flutes.



How to hold a piece with a flaring bottom on the drill press. Clamp it into a V-block, then clamp latter into vise.

IDEAS FOR SERVICE MEN

IF YOU'VE BEEN READING this department for the past few months you may have noticed a couple of V-mail letters from boys overseas. We reproduced them just as they came in, but they were unusually clear examples. A good many of the V-mailers we receive are hardly legible, much less printable (we aren't referring to their language) and one soldier has a sensible suggestion to take care of this trouble. We would like to second it and ask that any of you who send us V-mail in the future follow the idea.

Pvt. Joseph Hoeflick, Camp Crowder, Md., writes us as follows, on a postcard, incidentally: "Type your V-mail letters entirely in capital letters, with double spacing between lines. You'll be surprised how readable they are, even in their greatly reduced size." Of course, most of you won't have a typewriter handy, but you can print them carefully instead.

CPL. WALLACE B. CASE of the 2nd Air Force, Colorado Springs, Colo., was having hot water trouble up there where it gets mighty cold in winter. Seems that the company commander was trying to conserve coal, and a great deal of hot water was lost down the drains when the men were shaving for the simple reason that the stoppers kept getting mislaid. New stoppers couldn't be purchased, but one morning the boys were surprised to find a complete set of the most efficient stoppers yet encountered sitting snugly in the drains. They were made from old tire casings, cut to the diameter of the drain outlets. Hot tire patches were vulcanized on top of them to rest on drain rims, making them doubly watertight. Through the center were large bolts with heavy chains attached. A sketch shows cross-section of one so other outfits having similar difficulty can copy them if desired.

HOW TO HANG YOUR HAT in the tropics with all the hat racks left back home is a problem that holds no terrors for Pvt. James Frankel, stationed at some censorable spot in the South Pacific. We can tell you this much though—the boys on Makin Island used Frankel's method with great success, after they had gotten rid of all the Jap hats around. All you need is a palm tree, with or without coconuts, and a couple of empty cartridge cases. Just drive the cartridges into the trunk

of the tree at a convenient height. You can hang not only your hat on them, but your rifle, raincoat and other field equipment as well.

AIR FORCE MECHANICS will be interested in this next idea, submitted by Pfc. Jesse H. Barrow, Boca Raton Field, Florida. Says Jesse:

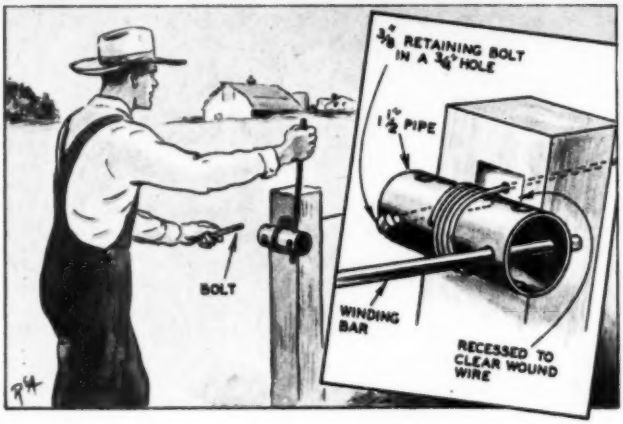
"Our tool box gets pretty heavy when we have to walk a long distance from hangar to plane and vice versa, so I conceived the idea of making a "wagon" to carry it on. Mine was made from discarded packing crates and the handle was a piece of scrap tubing. Wheels were casters obtained from the supply room. I've enclosed a sketch of it (see drawing) which anyone wanting to make a duplicate could follow, though there are any number of ways to do the job, using one's own ideas and the materials at hand."

WE THOUGHT WE'D HEARD of every possible way to improve the shine on a pair of GI shoes, but here's another that really gets down to fundamentals. It's from A/S John Donald Schaeberle, who's a student at the University of Pittsburgh in Pa. John simply squeezes lemon juice on the shoes and then rubs them briskly. He says it gives the leather an unbeatable shine providing you don't forget and pour on the fruit juice *after* it's been mixed with the gin.

SERVICE MEN MAKING long distance calls, suggests David Deutsch, of Brooklyn, can avoid overtime charges and holding up the line by using a 3-minute egg timer to time their conversations. Just set the timer on the shelf under the phone—when the last grain of sand has tricked through the neck—that's all, brother!

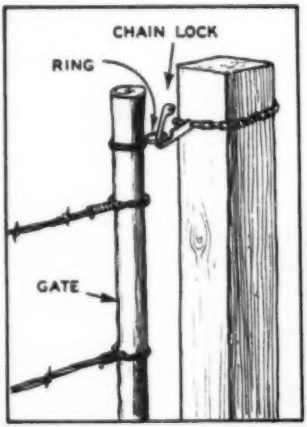
SERVICE MEN, ATTENTION!

This is your department, and if you like it enough to want to make it better, you can. It's all up to you! Send in your ideas—anything you think may help your buddies in the Army, Navy or Marines. You'll be helping yourself too, because MECHANIX ILLUSTRATED pays from $2.50 up for material used. Address "Ideas for Service Men," MECHANIX ILLUSTRATED, 1501 Broadway, New York 18, N. Y.



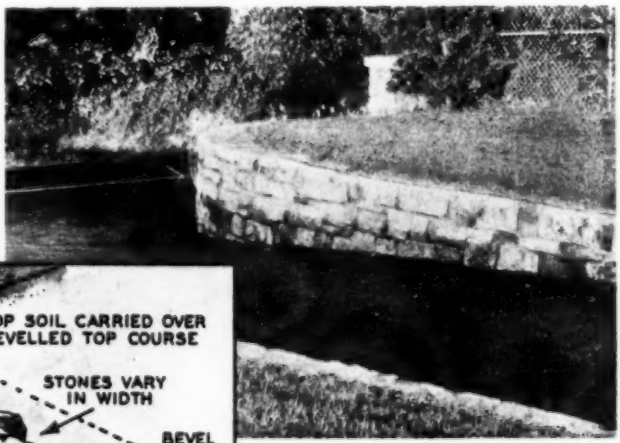
Tightener For Wire Fences

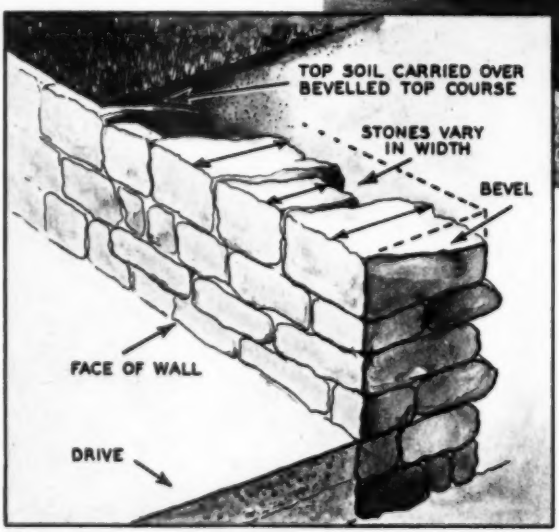
A WIRE tightener for the farm fence can be made from a short piece of 1½" pipe as shown. Use it as a windlass, tightening it with a bar inserted through holes in the sides. A loose bolt through holes on the other side and into the post will lock it in position. Post must be recessed to clear wire already wound.



Chain Lock Holds Wire Gate

A WIRE gate may be closed easily and stretched taut if it is hooked with a length of side links of a tire chain attached to the fence post as shown. A ring, wired to the gate, is clasped by the chain lock for closing. This fastening cannot be nosed open by animals.





Laying Stone Walls

THE expense of selecting and cutting uniformly wide field stones for the top course of a retaining wall can be saved by beveling the top of the wall in the manner illustrated. This makes it possible to use stones that vary in width since only their face and top edge are visible after the bank has been leveled off flush with the wall.

Photo Mirage

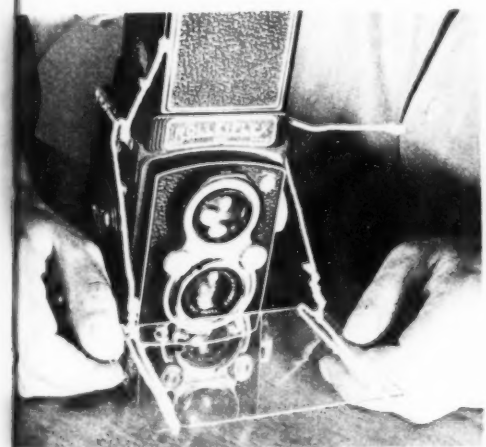
by Rene Leonhardt

LOOKING for something different in pictures? Here's a simple trick which will enable you to turn out all sorts of amusing and startling mirage effects. The only materials necessary are a piece of clean glass or a mirror (like the square kind found in a lady's purse) and a couple of pieces of string or a few pipe cleaners.

Wrap the string or cleaners around the glass or mirror and attach it to the front of your camera, arranging it so it is perpendicular to the plane of the camera lens. Make sure that the edge of the glass touches the lens mount just opposite the bottom of the lens itself. Then fire away! This idea can be used in enlarging, also. Fasten the mirror to the lamp side of the enlarging lens and adjust negative position for best effect. The lighter, reflected image will have to be brought up by dodging.

Two-headed portraits like the one shown are easy to produce. And you can fill any crowded street with water. A tall office building growing from the middle of a lake is another shot which will make your friends think you are gifted with mystical powers.

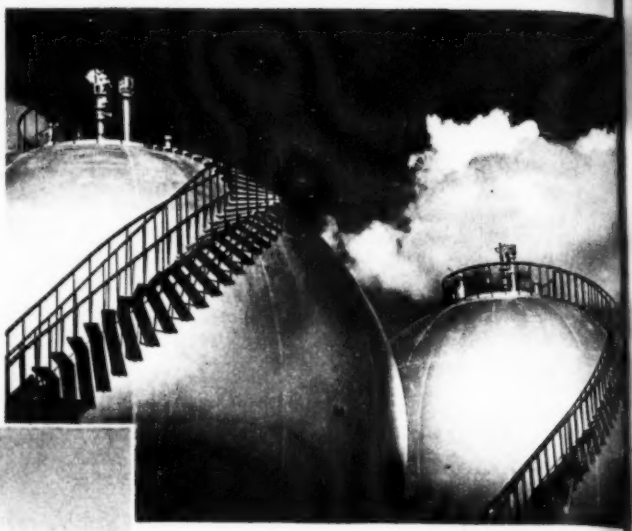
Turn it any way you like: it's still the same girl.



Ice cream peddlers (right) don't mind standing knee-deep in water. Here's how it's done (above).

PHOTO CONTEST

FIRST PRIZE: ($10.00): Aviation Gas, by I. K. Moorhouse of Beaumont, Texas; taken with a Speed Graphic. SECOND PRIZE: ($5.00): Close Hauled, by Bill Ficklin of Ithaca, N. Y.; taken with a Speed Graphic. THIRD PRIZE: ($4.00): Among The Pillars, by Bob Buchanan of Jersey City, N. J.; taken with a Speed Graphic. FOURTH PRIZE: ($3.00): What's Cooking, by John Makar of Detroit, Mich.; taken with a Rolleiflex.



1st PRIZE

2nd PRIZE

3rd PRIZE

4th PRIZE

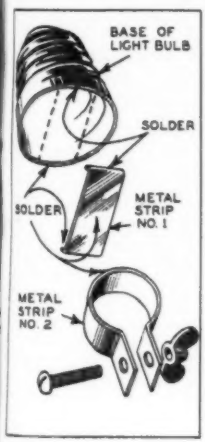
Submit contest prints unmounted—no larger than 8x10 inches. With each print list camera, film, lens opening and shutter speed, illumination and developer. Write your NAME and ADDRESS on the back of each print and wrap securely with cardboard or corrugated stiffeners. ENCLOSE POSTAGE for the return of unused prints. Published prints cannot be returned. Address: Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York 18, New York.

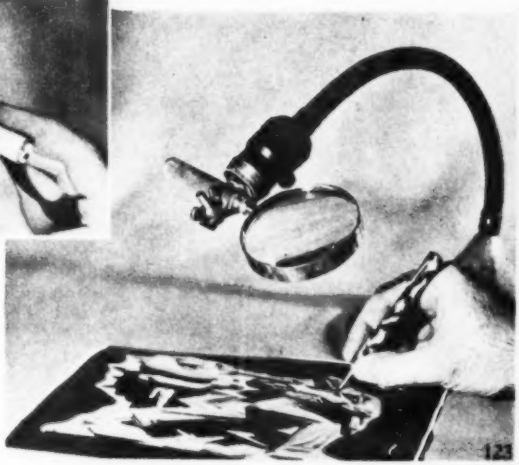
PHOTO KINKS

SPIRIT LEVEL: Make it from an empty developer tube. Almost fill with water and scratch line on glass for centering the bubble.—L. Hochman.

TRIPOD WRENCH: A wrench for loosening a tripod screw can be made from a wooden disk as below. Cut opening to fit screw handle.—H. R. H.

CUT FILM: Single sheets of cut film can be processed in large glasses.—L. Hochman.





RETOUCHING GLASS: A magnifying-glass holder, made as shown, will fit into gooseneck lamp. Use cleaned out base of a discarded bulb.—Robert Scott.

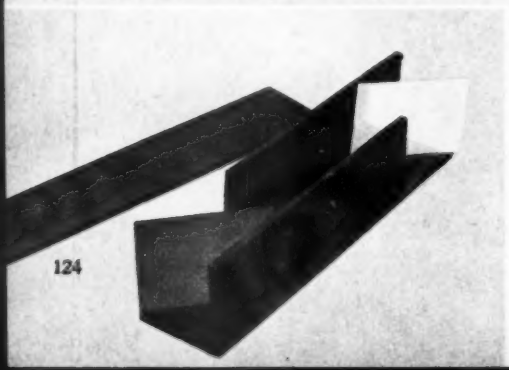
Periscope Camera

With this attachment you'll be able to shoot over the heads of the crowd and get those impossible pictures.

by Roy Lester

Set your camera and sight through the periscope.

Long cable release or string releases the shutter. Periscope box and its two mirrors are shown below.



MANY times we come upon exciting events which are good picture material, but we are foiled because our cameras can't shoot "through" people. We can use the hit-or-miss method and raise our cameras over the heads of the crowd, but then we only can guess whether or not the resulting pic will include our subject—and composition is out of the question.

Fortunately, there is a remedy for this situation. It consists of building a special periscopic view finder attachment for your camera, which will permit you to take pictures with your camera raised high above your head. Anyone can build it at little expense for it consists of nothing more than a long, wooden, box-like tube with a mirror set in each end to reflect the view, as seen from above, to the photographer's eye, below.

To make it, first obtain two small pocket mirrors, measuring about 3″x4″ and then make a long tube-shaped, wooden box, as shown in the photo, to hold the mirrors. With mirrors of the above dimensions, the box should measure 3″ deep by 3 15/16″ wide on the inside. Its length can vary from 1′ to 3′ in length, depending on how high you will want to elevate your camera or how short a person you happen to be.

The mirrors should be set into this box, one at each end, in parallel positions facing each other and at 45° angles as shown. In front of the upper mirror,

there should be a 3"x3⅞" opening in the box to permit the view to enter. Another opening of the same size should be in the opposite end of the box in front of the reflecting surface of the other mirror so that when you look into this opening, you will see, reflected in the bottom mirror, the view from the top mirror. The mirrors can be held in place with black scotch tape, or can be set in wooden slots nailed to the box. A coat of dull black paint will prevent annoying reflections from fogging the view.

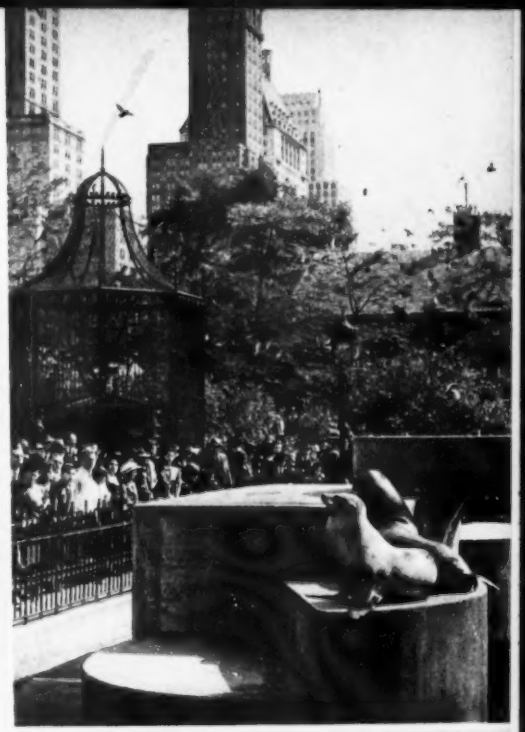
The camera can be attached to the upper part of this periscope by means of a ball and socket attachment as shown and should be adjusted so that its lens will take in the same view that the upper mirror reflects down to your eye. Thus, instead of using the camera's view finder at eye or waist level, you use a periscopic view finder, which permits you to frame your picture easily while the camera is held high above your head. You do not sight through your camera's view finder, but to one side of the camera. Make sure that the camera is parallel to the front of the periscope.

The problem of snapping the shutter of the camera from your lower position can be solved by using an extra long cable release or by attaching a string to the shutter release of the camera.

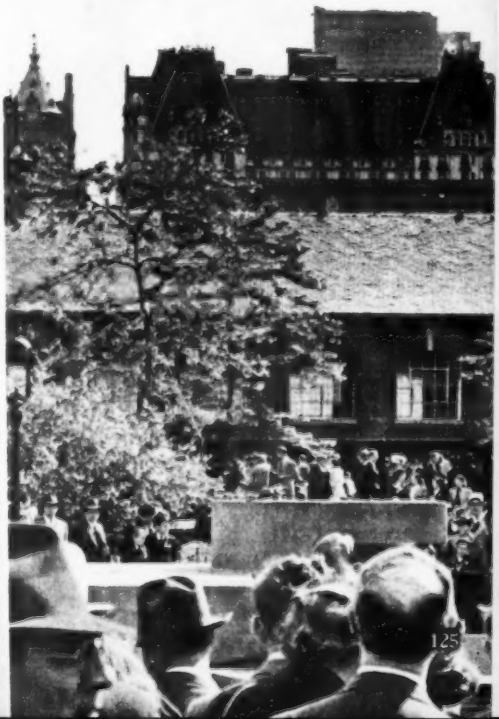
With this periscopic attachment, crowds will no longer prevent you from snapping pictures of important events, such as parades, accidents, etc. There are also other uses to which you can put it. For instance, at zoos, where low fences stand in your way, you can reach over the tops of the fences with your periscope camera and get the pictures. Sometimes even though there is no obstacle to overcome, a high-angle shot will make a better picture and here again the attachment comes in handy.

Of course, before taking pictures with this outfit, you should take care to focus your camera for the correct distance and set the lens. Also, since the camera may be shaken easily during the exposure, it is a good idea to use fast shutter speeds of from 1/100 to 1/250 of a second to insure sharper pictures.

If you so desire, you can fasten a socket to the bottom of the periscope and use it on a tripod for time exposures.



Here is one of the many difficult shots you can get with the periscope camera. A shot of the same scene with an ordinary camera (below) is disappointing.



CIRCUS TOYS

These toys, designed for fun and action, may be built with hand tools from scraps of lumber.

by R. L. Fairall

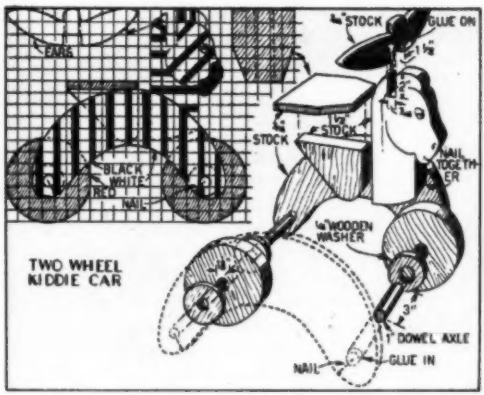
Kiddie car has two wheels and is striped to resemble a zebra.

Ferris wheel, in gay colors, can be pushed or pulled about the floor.

Kiddie car drawing is at right. Ears are handle bars.

TWO-WHEEL KIDDIE CAR: The triangular saddle support and the head and neck sections of the zebra are cut from 1½" stock and a 2"x¾" notch is sawed in the top of the head. The ears or handle bars (¾" stock having a 1½" notch sawed in the bottom) are slipped over the notch in the head and glued and nailed in place. The two side sections are sawed from ¾" stock and 1" holes drilled for the axles.

These sides are nailed on either side of the head and the saddle support; the saddle is nailed to the support and, where it touches them, to the sides. Two wheels 7" in diameter are sawed from ¾" stock, two axles each 3" long cut from 1" round stock, and four wooden washers cut from ¼" stock. The wheels with a washer on each side are set between the feet of the zebra and the axles are slipped in and glued in the feet. Then a nail is driven into the axles through each

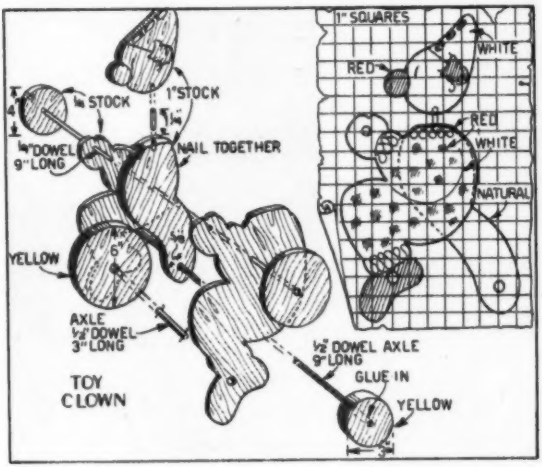


of the feet to keep the axles from turning. The wheels should revolve freely around the axles. A little soap or grease will help. The wheels and saddle are painted red and the zebra white with black nose and stripes.

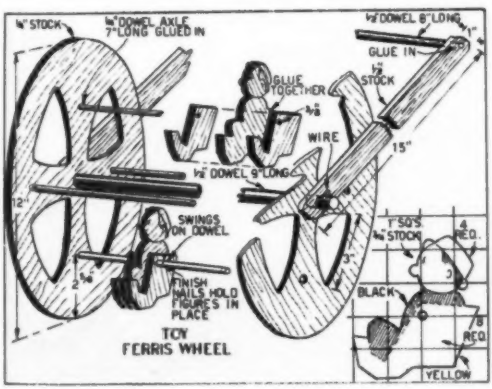
TOY FERRIS WHEEL: Two 12" disks are sawed from ¼" stock, four triangular sections are cut from each, a ½" hole is drilled in the centers and four ¼" holes drilled in the spokes. Four little figures, each seated in a carriage and each made up of three sections glued and tacked together having a ⅜" hole drilled through, are swung on 7" lengths of ¼" dowel. Finish nails tacked part way into the dowels on each side of the figures keep them from sliding to one side. The ends of these ¼" dowels then are glued into the two wheels and a 9" length of ½" dowel is put through the center holes.

TOY CLOWN: The clown's head and the center block are jigsawed from 1" stock and a ¼" dowel neck glued into the head and this section. Next the two body sections are cut from ¼" stock and nailed to the center block, holes are drilled in the hands and a 9" length of ¼" dowel glued in. A 4" disk cut from ¼" material is glued to each end of this dowel. The front wheel 6" in diameter is cut from 1" stock, a ⅝" hole is drilled in the center, and ½" holes drilled in the figure's feet. The wheel is set between the feet, and a ½" dowel axle slipped through.

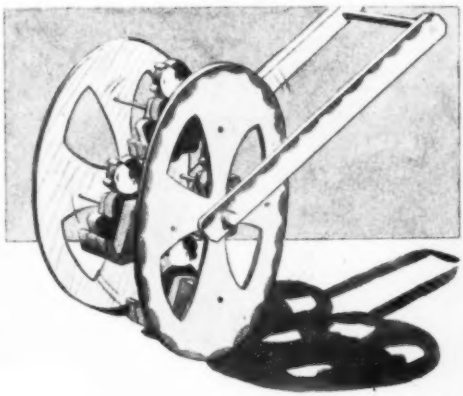
Every circus must have a clown. Follow construction below.



Ferris wheel, a rolling toy, has four swinging men.



Figures swing on dowels through the wheels.

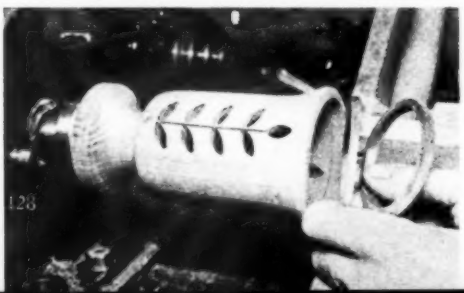


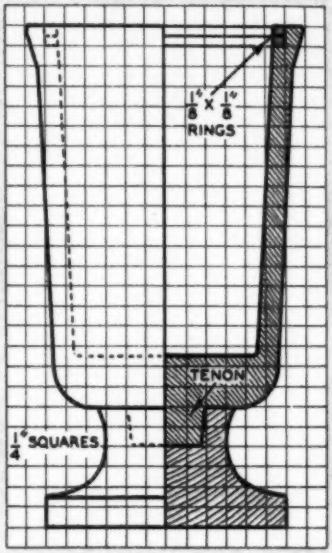
Vase WITH GLASS LINER

This graceful vase has a striking color-backed design.

FIRST obtain a small glass tumbler of the desired color. If one is not available, a clear glass may be painted on the inside. Bowl and base are turned from one piece of walnut to the dimensions given in the drawing, the outside of the bowl first. Note the tenon turned between bowl and base. To facilitate turning the inside, the handwheel on the tailstock is removed. Then part the bowl from the base, leaving [*Continued on page* 138]

Two rings are set in grooves to reinforce neck.





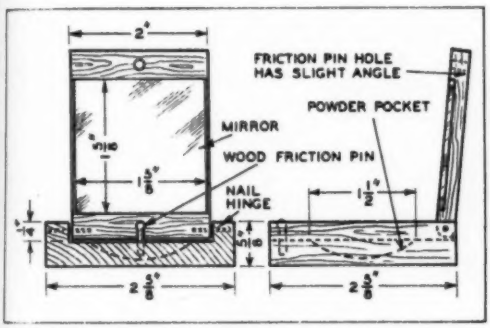
Vase center is colored tumbler.

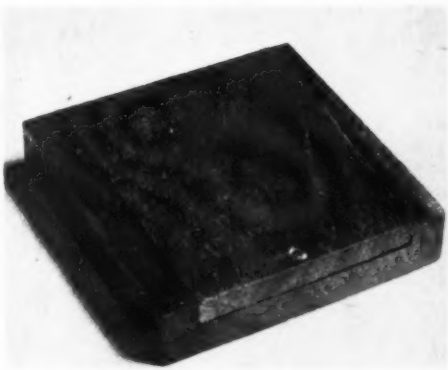
Turning out inside of bowl (below).

Assembling sides and base of vase.

WOODEN COMPACT

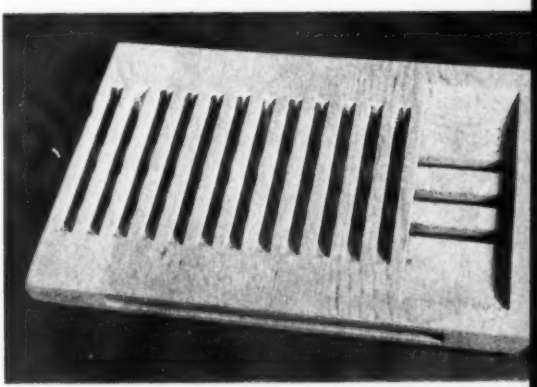
THE home craftsman can make this neat and novel little compact from those scrap pieces with a beautiful grain which he is reluctant to discard. Glue the block for the body to a piece of wastestock for mounting in the lathe and turning out the powder pocket. The mirror should fit snugly in the lid and is held in place with glue. The lid is hinged to the box and a small friction pin is installed as shown. Sand thoroughly and finish with three coats of shellac rubbed down well between coats with 4/0 steel wool, or you may desire to paint it to harmonize with a bedroom color scheme.





Finished compact is attractive. Peg holds down lid.

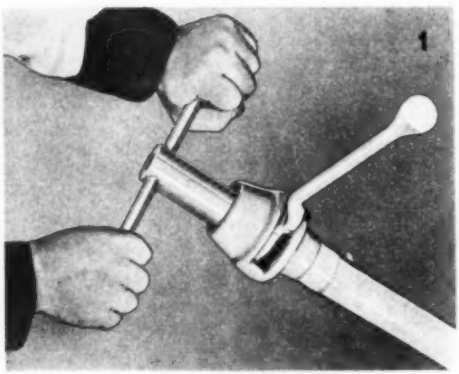
Wooden Drain Rack

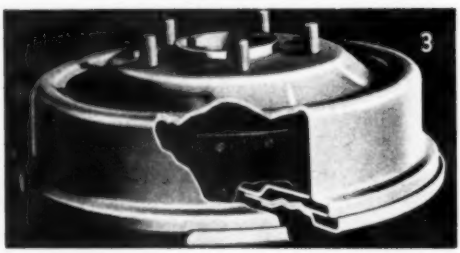


THIS serviceable wooden dish-draining rack will replace the wire or metal types which are no longer available. It is easily made with a dado or groover on the bench saw and, in a pinch, hand tools can be used. The rack can be made from almost any available wood: cypress or cedar being preferable. The board should be 1⅛" thick and 11"x14" with the grain running the short way. For a wider or narrower sink, the size may be changed. First, the board is reinforced by the insertion of a ½" [*Continued on page* 136]

KEEP IT ROLLING!

by Frederick C. Russell





SOME JOBS that look tricky are simple enough when you know how, but don't forget that some of the easy looking jobs are plenty tough. In this latter group put those jobs requiring special tools. One motorist who reads these monthly remarks on cars removed the steering wheel bushing but couldn't get at the lock nut of the remote-control gearshifter handle. No wonder! He will need a special thin-wall deep-socket wrench to reach this lock nut. (Photo 1)

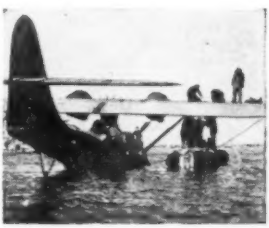
WHEN GEAR SHIFTING GOES BAD these days we look to the remote control on the steering post rather than to the gears themselves. Adjustments may be needed at the bottom of the post. But cars differ widely, in spite of what appears to be standardization. The only cure for gear stickage in one car was to replace the bushing in the steering post. (Photo 2)

WHEN DRIVING through heavy rains it's natural to suspect that grabbing of the brakes is due to water getting into them. On some cars, however, the brakes are triple-sealed. Take a look at the instruction book to see if the brakes on your car are designed like the one in the accompanying photo. One thing no brake has been designed to guard against is grabbing from grease or oil working past the wheel bearings. Don't increase this risk by letting a service man fill the lead cap with grease. This may force some of the old grease into the brake assembly. If you suspect that grease is the culprit, remove the wheel and wash drum and brake in gasoline. (Photo 3) [*Continued on page* 138]

Your car needs careful attention, particularly during wartime. If you have a problem with your car, ask Mr. Russell. Just send stamped, self-addressed envelope to him at Mechanix Illustrated, 1501 Broadway, New York 18, N. Y.

. . . Two TIN FISH FOR TOJO!

UNTIL it is slammed straight for the belly of a frantically twisting, dodging Jap ship, a Navy aerial torpedo should be handled with care! And that is the way this deadly pair, cradled one over the other in a rubber barge, are being transported. In rearmament service these big rubber boats provide their lethal loads with a "safety zone" . . . a plump cushion of air that completely surrounds the cargo, safeguarding it against the danger of shock or collision. Many Evinrudes are used in such service, providing capable driving power and a high degree of maneuverability.

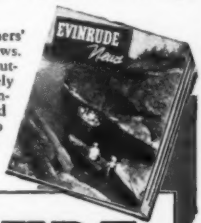


1 **Servicing seaplanes** is another job for which rubber boats are ideally adapted. For powering big rubber boats, Evinrude now produces a special model of its famed Lightfour, built with deep shaft, high-ratio reduction gear, and 360 degree steering that permits the boat to be maneuvered in any direction.

2 **Up she comes,** the day's work done! This photo shows the type of bracket widely used for mounting an Evinrude on a large rubber boat. Evinrude has developed many special mounting brackets to meet the varied needs of the scores of different types of small craft used by the Army, Navy and Marine Corps.

3 **The Japs** use outboards too, as is shown by this photo of a Jap outboard captured somewhere in New Guinea, and patched up by our boys to serve in ferrying supplies to the beach. Perhaps, by this time, it has been replaced by a sparkling Evinrude Speed itwin, a "popular number" in the far Pacific!

FREE! Send for copy of 1944 "Owners' Edition" of the Evinrude News. A pictorial magazine that covers outboards in war and peace — profusely illustrated with photos showing Evinrudes serving the Army and Navy, and pictures of happy peacetime uses to follow! Write for your copy! EVINRUDE MOTORS, 5053 N. 27th St., Milwaukee 9, Wisconsin.



EVINRUDE
OUTBOARD MOTORS

EVERY DOLLAR YOU INVEST HELPS SPEED VICTORY—BUY MORE BONDS

Developed-Surface Model

[*Continued from page 95*]

glue along the outboard faces of the battens and along the edges of the frames. Do only one side and get your bristol board in place as quickly as possible because the glue loses its grip if you leave it too long. Use clamps, spring clothespins or anything else that's handy to hold the bristol board in place. Then start at one end and drive in a ¼" flat head nail about every ⅜" along both chine and keel. Don't use brads for this as the heads may pull through the bristol board. When this side is completed, put the piece on the other side of the model. You will find, if you have done your work properly, that this paper will lie on smooth as silk-developed surfaces!

The same procedure is carried out for the two bottom pieces. One will overlap the other and glue should be smeared on the surfaces. Don't forget to put glue along the underside of keel and along the chine. When in place, nail up the way you did the topside piece. Don't put any nails where the rudder stock comes through as you've got to drill a hole there later on.

When all the paper is on and the glue has set, cut off the excess paper that may be sticking out here and there. Then coat the entire inside of the hull with the waterproof glue, letting it run in thick around the keel and chines.

The next step is to cut out the wood fin keel. This is easy, using the piece of carbon paper and a small saw. Remember the ¾" at the bottom. This wood keel is nailed to the inside keel by putting the fin in a large vise and placing the model on top of it. Then nail down through the inside keel into the fin. Later on put some more glue around where the nails went through. Be sure that the keel is truly parallel to the centerline of the boat as otherwise your model may sail much better on one tack than on the other.

Now make the wood mold for the lead keel. Go to the five and ten and get about five or six 8 oz. sinkers. Melt in a frying pan on the kitchen stove and pour in the mold. It will char a little but will do no harm. When cool, take the mold apart and nail the lead to the bottom of the wood fin by coming up through the lead into the wood. You can drive a nail through the lead quite easily. Don't try to drill it or you may break the drill.

Next drill the hole for the rudder port. A small piece of gasoline tubing will do in here. The hole must be tight and when the tube is in place, run some glue in around it. The tube should be long enough to extend about ¼" above the deck. Be sure that the hole for the rudder tube is parallel to the aft end of the fin keel. Make the rudder, rudder stock, etc., as shown in Figure 5. Put it in place and drive a small screweye at the bottom to hold it there. It should be free turning.

Now paint the entire inside of the hull with a heavy coat of enamel. Let it lie thick around the keel and chines so no water can ever get through or affect the paper. The bristol board deck should go on next, but not until you have run the mast support piece shown on Figure 3. This may be ¼" thick and ¾" wide. It runs from mold number one to number three. It is notched into the molds and glued and nailed. All the tops of the molds, this piece and the top of the transom should be faired off smooth. Then put the bristol board in place using plenty of glue along the edge and across the top of each mold. Nail it in place the same way that you did the sides and bottom.

Go over the outside of the hull and file off any nail heads that are not flush with the paper, making sure not to dig the paper while so doing. Sand lightly with fine sandpaper and give the entire hull a coat of flat white paint. If you intend to varnish the transom do this before painting and let it dry; then if you spill any paint on it, it may be wiped off easily. Rub down the outside of the hull when the first coat has dried and then apply a second coat of flat. Do this again when dry until you get a nice even surface for the final coat of white enamel.

Make the mast as shown in the details in Figure 6. It should be placed as closely as possible to where it is indicated on this plan. The foot of the mast sits on top of the deck on a small block of wood which is screwed to the fore and aft strip under the deck. Figure 6 gives the dimensions of the mast and boom and also sections through them. The spreaders are shown also. For rigging use some light galvanized solid wire if you have some around but if not use fish line. The sails are made of muslin or anything else that is handy and are made to the dimensions shown when finished. Actually, the cloth should be cut a little larger and hemmed all the way around. Instead of sewing the sails to the mast and boom in the usual manner, on this job, a small piece of wire was stretched along the top of the boom and another along the after side of the mast. The sails were sewn to this. The jib is, of course, sewn to the jib stay.

Most models when they start to sail carry a very bad weather helm and try to come into the wind all the time. This one is extremely well balanced and is not apt to do it unless knocked down by a heavy puff. In order to overcome any tendency in this direction the simple little device shown in Figure 7 was used. A small piece of wire was soldered to the top of the rudder stock with about 1½" sticking out aft and about 1" forward. Each end was made up into an eye. The after end was connected by the main sheet to the end of the boom. The other end had a small elastic band in the eye with a piece of light twine running up to the mast. Now, when she got a knock down, the pressure on the boom and sail, caused the reversed tiller to pull off to the leeward side. This kept her bow off and prevented coming up into the wind. When the puff eased up the elastic band brought the rudder back to the centerline.

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The Potter's Art

[*Continued from page* 101]

into long uniform ropes, and then uniting them into a perfect mass. The uniting of these coils perfectly is the hard part of the process, and great care must be taken not to leave an open place between them. Hand built pieces give a great opportunity for self-expression as they are very attractive when well constructed. If ware of a very smooth finish is desired the piece can be built extra thick and then turned perfectly true upon the potter's wheel. This will give a very beautifully finished piece if the hand building is well done. The turning should be done while the clay is still partially damp, or about as tough as leather. The foot which must be on the bottom of all pieces of pottery can be turned at the same time. Study the examples of feet on the bottoms of commercial pottery.

The strip method takes a little more equipment as the clay is rolled out upon a cloth with a rolling pin. The bottom is cut out with a paper pattern as a guide, and, instead of coils, long strips are cut with a knife and straight edge. This gives a flat surface to work upon and makes the building a little easier. In both processes, however, exceptional care must be taken to avoid air pockets or lack of union with the strips. Large pieces cannot be built all at one time if the sides are slanting out, but must be set away to allow the clay to stiffen. This does not mean that the clay is to be dried but simply allowed to set or stiffen after which the building can be completed.

Unfinished pottery must be kept as moist as the clay from which it is built until the work is done. There are two ways of doing this. One is to wrap the piece in wet cloth which will serve well if sprinkled frequently. A better plan is to obtain or make a large box with a tight cover and place a thick coating of plaster on the bottom. This can be kept wet at all times and will last indefinitely if the cover is kept tight. Burlap can be used in place of the plaster if desired. Set the pieces in this box on plaster of Paris slabs or boards. The plaster slabs are usually called "bats," and can readily be made by pouring plaster into an old frying pan. Oil the pan lightly, and fill so as to make a block about 1½" thick. A cupboard with shelves can be made instead of the box if desired. In any case, box or cupboard, the container must be tight so as to keep the moisture in.

The Potter's Wheel

Hand building is an interesting process, but throwing on the potter's wheel is far more exciting. A pottery wheel has a fascination that will stay with one for all time. It is an ancient craft which is finally slowly passing because commercial processes are much faster. It is thus in the hands of the lovers of the art and the amateur to keep the potter's wheel from joining the spinning wheel as a quaint old memory.

The equipment for throwing is very simple and within the range of any individual. The wheel can be homemade and should cost very little. There are several types of homemade wheels. There is the kick wheel which consists of a straight shaft with a large concrete fly wheel, some thirty inches in diameter, upon which the operator kicks with his right foot while sitting upon a seat over the wheel. Then there is the pedal type, made and adapted from an old sewing machine and pedalled in the same manner as a sewing machine. Lastly there is the crank and pedal type which is driven by working a horizontal pedal attached by a connecting rod to a crank in the vertical shaft. This last type, which is sketched for you here, has proved to be the most satisfactory in the author's classes. However, any type will do in the hands of a good potter.

Throwing takes practice and patience at first, though it is not actually hard as it is really nothing but a vertical lathe. With a few weeks of practice the novice should be able to make low bowls and small pieces of various shapes. Tall pieces will take more experience.

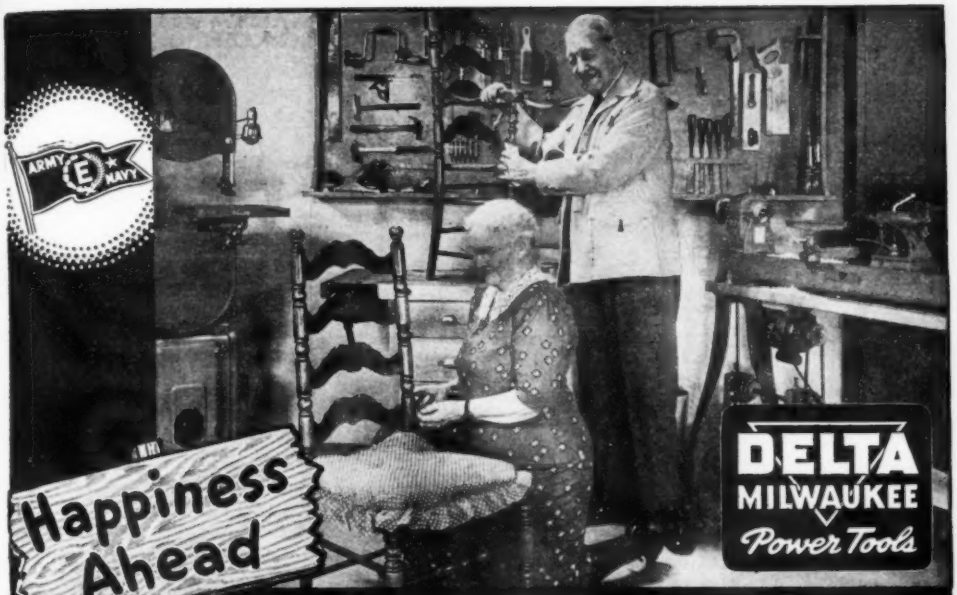
Throwing

The clay must be thoroughly wedged and of medium softness for throwing. Not too soft and yet not too stiff. Very soft clay is hard to control, and very hard is difficult to work. Try, therefore, to hit a happy medium. Use a lump of clay about the size of an indoor baseball.

Run the wheel counter-clock-wise and run it slowly. Use plenty of warm water on the hands at all times. Practice centering the ball for the first lesson. (The term "throwing" probably came from the practice of throwing the ball upon the wheel head to make the clay stick. If there is water on the wheel head, anyone standing near will doubly appreciate the act.) If a circular board is fastened to the wheel head with lumps of clay, the work can be much more easily removed from the wheel when the throwing is finished. A professional will cut and remove the piece directly from the wheel head, but this takes practice. The circular board is a happy solution as board and work can be slipped from the wheel without even jarring the piece.

This concludes the first pottery article. Next month Mr. Jenkins will describe in detail the step-by-step procedure of turning work on the wheel, with complete photographic illustration. Be sure to watch for it in your August MI.

About one-third of all vegetable disease control is accomplished by rotating crops so that no beds or fields are planted with the same or related crops on successive years.



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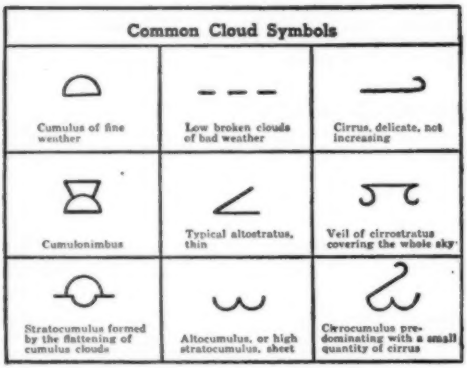
The School Shop

[*Continued from page 105*]

weather he encounters on his flight. Such reports are called PIREPS, and besides his time, place and altitude, he must give the following items: clouds, weather, turbulence, visibility, wind direction and velocity and icing conditions. Amounts of icing are reported by means of the symbols: ICG--for a trace of ice, ICG for light icing, ICG for moderate icing and ICG+ for heavy icing which the regular de-icing equipment can't handle.

(The School Shop aviation lessons are being published in book form titled HERE'S HOW TO FLY. The publisher is Duell, Sloan and Pearce of New York City.

There are 21 chapters and over 200 illustrations covering history, aerodynamics, navigation, meteorology, engines, load factors and parachutes, and a special chapter of 200 multiple-choice questions and answers like those used on C.A.A. Private Pilot Examinations. The price is $2.00. Copies may be obtained by writing to the Aviation Editor of MECHANIX ILLUSTRATED. Make check or money order payable to Duell, Sloan and Pearce.


Common Cloud Symbols
Cumulus of fine weather
Low broken clouds of bad weather
Cirrus, delicate, not increasing
Cumulonimbus
Typical altostratus, thin
Veil of cirrostratus covering the whole sky
Stratocumulus formed by the flattening of cumulus clouds
Altocumulus, or high stratocumulus, sheet
Cirrocumulus predominating with a small quantity of cirrus

Collet Draw Tube

[*Continued from page 108*]

sleeve and handwheel is the thrust bearing which, in the case illustrated, as an A.T.B. No. A-97, a type designed for automotive use. A tubular shield secured to the sliding collar or the handwheel (but not to both) with three 8-32 hollow-head set screws protects the ball bearing from chips and dirt. If desired, a groove can be machined around the circumference of the handwheel hub or sliding sleeve and one or two pins inserted through the shield to lock the assembly together: then the pin at the tapered end of the sliding collar will not be needed. Keep the ball bearing lubricated with a few drops of machine oil, and run a drop or two under the sliding collar.

Wire Movie Film Reels

[*Continued from page 115*]

with a solvent such as cleaning fluid. With a file and abrasive cloth, remove any projections or rough areas on the rim and spokes which might catch or damage the edges of the film and give all surfaces a coat of brushing lacquer or enamel. When this dries, the reel is ready to use. You will find it easier to thread than most reels stamped from sheet metal, because the construction is more open; and the reel is likely to be quite a bit stronger, too.

Drilling Plastics

[*Continued from page 117*]

the proud possessor of an angle vise, drilling a hole at a perfect angle won't be so much of a job. But if you don't own such a thing, you might be able to clamp your work on the drill press table, supporting it with wedges which may be clamped to the piece of plastic. If you can afford to give all your drills a perfect angle for drilling in plastics . . . which won't make them so good for drilling in metal, or even wood, you're well off. But if you have only one set of drills which you must use for whatever job comes along, you'll just be a little more careful and make the regular drill angles do.

It might be well to remember that a thickness of $\frac{1}{16}$" is about as thin as you can go, if you want, for instance, a tube. Thinner walls get very brittle. I found in making plastic sleeves for lipsticks that you can't go under that, and .075 is even better.

As in other materials, it is always a good idea to punch your hole mark first, and, if possible start it with a center drill. It will make the drill start where it is supposed to dig in, and require less pressure to make the hole. If everything is in perfect order, the chances are very good that you'll get a perfectly smooth hole which needs no or little polishing. If there are chatter marks, you might use a mounted grinding wheel to do a little additional smoothing out.

Wooden Drain Rack

[*Continued from page 129*]

dowel across the grain ½" in from each edge. The plate slots are 7/16"x16" and are dadoed from the top surface to a depth of ⅝"; the silverware trough measures 3"x9". Then the board is turned over and three 7/16"x½" lengthwise slots are dadoed. These cuts should be just deep enough to meet the crosswise cuts providing holes for drainage. Three coats of spar varnish are applied to finish the rack.

A two-ton duraluminum gate from New York's Triborough Bridge was a large item donated in the recent national drive to collect aluminum for defense.

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The Big Boys' Eyes

[*Continued from page* 37]

maneuvering in closer to the mountain peak than the Zero cared to go.

It was a game of "catch me if you can," played with grim purpose. And at last the daring of the American paid off. After some minutes of futile pursuit, the Jap apparently decided he had had enough.

With a parting burst of his machine guns which wasn't even close, the Jap broke off the game and headed into a cloud bank.

Another scout on the Attu invasion, after dodging Jap planes and flak, found himself forced down close to the ground by heavy weather closing in.

As he came down within 200 feet, he made out two figures against the rocks some yards ahead. They were Japs. The enemy soldiers were staring up at the plane. One of them lifted his rifle and started firing.

"Nobody has any respect for us," the pilot reported. "Now they're trying to bring us down with rifle fire."

The scout plane opened up on the Japs then with its light machine guns and the Japs dived for cover. But the story of the scout plane dodging rifle fire from the ground still is making the rounds in the Pacific fleet.

Observation scouts have orders to stay out of offensive action. Occasionally, the pilots forget. When opportunity knocks they like to go in with guns blazing.

One pilot, spotting during a Pacific engagement, saw a main battery salvo land flush on the target. Japs scrambled out of hidden shelters and scurried back like terrified ants.

"They're running out," the pilot reported excitedly. "Shoot 'em again—shoot 'em again."

Sight of the Japs fleeing in the jungle was too great a temptation for the pilot and radioman. They dove to the top of the palms, strafing as they came, spraying the Jap island with a hail of bullets from their light machine guns.

Shipmates crowded around them on their return. How about the strafing attack? Had they killed any Japs?

"Don't know if we killed any or not," the pilot said. "But we fired—and they fell."

During attack, spotters often try to get close to their ships. Fire power of the big warships is so great that few Jap planes dare come in too close.

But the spotters don't usually run away unless enemy opposition leaves them no choice. Their job is too important and must be carried out if at all possible.

During one heavy bombardment, Jap anti-aircraft fire was so heavy that at times the plane was completely hidden by the little black puffs. The spotter was ordered by his ship to get out of there fast.

"I'm getting," he sent word back.

But minutes later he called in, asking for and receiving permission to go back over the target. Flak or no flak, they needed him. He had to be in there calling the shots.

Being the "eyes of the big guns" is no easy task, but you'd never know it from talking to the pilots.

"It's just a routine job," one of them told me. "Sit up there and call the shots.

"Sometimes we get scared. But for me the worst part is landing. When it's rough and you have to come up to the ship over steep water, it bounces the crate around like the devil. Hell, if you don't watch out you'll end up being seasick."

Vase With Glass Liner

[*Continued from page* 123]

the tenon on the bowl portion, and saw the bowl in half lengthwise, using a thin hand saw. Mark out the design for the sides of the bowl and cut out on the jig saw, starting the cut at the tenon. Mount the base on the faceplate and turn the hole for the tenon on the bowl. Glue the bowl together using ⅛" dowels, and glue the tenon into the base. Now true the whole vase. Turn a groove on the inside of the top edge into which two reinforcing rings, with grain running in opposite directions, are glued. Sand smooth and finish with shellac while still in the lathe.

Keep It Rolling!

[*Continued from page* 130]

HINT OF THE MONTH

A form of gasoline waste that can be prevented is having too much oil in the air cleaner where the latter is the oil-bath type. Excess oil reduces the air supply to the engine, thus automatically enriching the mixture. But that isn't all. Running on an over-rich mixture the engine shakes too much during idling, thus disturbing the carburetor float level.

The war has cut off American imports of wood-pulp from the Scandinavian countries and reduced shipments of pulpwood, wood-pulp and newsprint from Canada. Domestic production is expected to decline this year, as well. SAVE YOUR WASTE PAPER. IT WILL HELP TO WIN THE WAR!

This American is *not* expected to buy an extra War Bond in the 5TH WAR LOAN

But we are.

For each of us here at home, the job now is to buy extra Bonds—100, 200, even 500 dollars worth if possible.

Many of us can do much more than we ever have before.

When the Victory Volunteer comes to you and asks you to buy extra Bonds, think how much you'd give to have this War over and done.

Then remember that you're not *giving* anything. You're simply *lending* money—putting it in the best investment in the world.

5TH WAR LOAN

Let's Go . . . for the Knockout Blow!

FAWCETT PUBLICATIONS, INC.

This is an official U. S. Treasury advertisement—prepared under auspices of Treasury Department and War Advertising Council

Weathering The War

[*Continued from page 73*]

one thing, these roving chunks of air are drastically affected by the terrain over which they flow. A column pouring down over large bodies of water will, in all likelihood, carry in its wake weather that is moist and raw as well as chilly. When a drenched, heated air mass rolls over cold ground, cloudy weather will prevail, for the bottom layers of the air are cooled to the point where some of their moisture condenses. If a cool, clear air mass traverses a warm area it absorbs little or no warmth from the sun. But the heat rays go on bombarding the earth's surface, whose heat is then absorbed by the air.

Topography is all-important. Air masses are radically altered by dips and swells in the earth's profile. A warm current coming in low will swirl up the side of a mountain and be hurled upwards for miles, its moisture being condensed enough to keep a snow-cap on the mountain range straight through the summer. Once the peaks are behind, the billowing mass of air will roll pell-mell down the opposite side of the mountain, being heated again by the higher atmospheric pressure in the lowlands. Result: once dried, the body of air is so parched that it will suck in every cloud from the sky. There, in a nutshell, is the reason for California's balmy weather.

If you want to see for yourself how hot and cool fluid masses lock in battle, perform this simple experiment. Heat a tumbler of water and color it red. Fill another tumbler with cold water and give it a blue tint. Then empty both tumblers into a bottle and watch the fun. A writhing, turbulent "front" is immediately established between the two agitated bodies. The cool, heavy water pushes downward; the heated, light water tends to surge upward.

Translate this turbulence to the global plane and you have the key to the weather's mechanism. Fronts of this type are being established all the time in the atmosphere. Snaking their way over the earth's surface, they make all types of weather—from the sun-drenched, placid clime of a tropical isle to the flighty, violent swings in the weather over Tokyo, often as abrupt as a manic-depressive's flare-ups.

There's one man in this country who didn't turn his back on these air-mass fronts before the war—37-year-old ex-concert pianist Irving Krick (MECHANIX ILLUSTRATED, Sept. 1941). He was a one-man meteorological Blitz who, almost single-handed, revolutionized the science of weather forecasting and forced the Weather Bureau to make an about-face. Having studied in Norway under a grant from the Rockefeller Foundation, young Krick knew all about Bjerknes' Air Mass Analysis. In 1938 he set up an observation post at the California Institute of Technology and tackled the global gusts with a gusto.

His long-range predictions were uncanny. Two months before the event he could tell which fruit-growing section of California would be visited by dread frost, despite the Weather Bureau. Before long industries and institutions from coast-to-coast were paying the Krick Industrial Weather Service hundreds of dollars for the lowdown on next month's weather. Today Dr. Krick is in the Air Forces' Weather Division.

Die-hards for a long time looked upon Krick's weather previews as a variation of astrology. Such daring was visionary and, as such, anathema to dyed-in-the-wool conservatives. Even at the outset of the war, insistence on working long-range forecasts "met considerable opposition both inside and outside the Army Air Forces," General Arnold relates. But today our fighting services are sold on this crystal-gazing technique. By pooling all information in United Nations meteorological brains, together with vital data captured from German sources, the job was done, and put on a world-wide scale, at that.

Generally speaking, due to the torque effect of the earth's rotation, weather marches from northwest to southeast in the northern hemisphere, and from southwest to northeast in the southern hemisphere. This broad pattern is distorted locally by mountain ranges, lakes, oceans, tracts of land, ocean currents, and other topographical details. Taking account of all these variables, AAF Flight Control's Weather Wing has set up observation stations in a vast global network, to cope with the flow of world weather.

Arctic weather posts are key points in this network, since they're on the spot where the polar cold masses assemble and take off. The Army's Weather Service trains whole troops of Arctic explorers for this lonely, hazardous job. At special training camps, the selectees, perfect physical specimens all, learn how to live off the country. Groups of two to five men, accompanied by a cook and a scout, are carried by plane to their lonely posts with a winter's cache of supplies.

If anybody thinks an Arctic observer's berth is a cozy one, let him listen to the tale of one group of meteorologists stationed on the narrow ledge of an ice-jammed fjord at Prince Christian Sound, on the desolate, uninhabited southern coast of Greenland. The buildings at this outpost had to be tied down to the rocks with cables, to keep them from being blown off by the 90-to-175-mile-an-hour winds that prevail there! After taking that kind of treatment for six months at a stretch you don't have to develop an inferiority complex when a P-38 pilot comes strutting along.

These observers are plenty tough. Take the case of five men and a noncom who spent all of one winter cooling their heels, along with other parts of their anatomy, at a station for north of Labrador. When, at long last, an airplane got through to them in the spring, it brought a routine letter from their regional control officer, asking for volunteers for "isolated duty in the Far North."

Weathering The War

At that point an ordinary mortal would have said, "Is he kidding?" But these five isolationists, to a man, sent a snappy answer back: "We want to volunteer. This job is simple—we want to see something really tough." Let's hope those gluttons for punishment were satisfied with the North Pole ice floe they probably wound up on.

To borrow a phrase from the military, the battle with the weather is an attack in depth. Pilots of reconnaissance planes, fighters and bombers are always interrogated about weather conditions encountered on various levels during their flights. It's not beyond the realms of possibility that paratroopers are instructed to take mental notes as they glide earthward, as further hints to the weather man. But the most unflagging observer of all is a midget robot—the radiosonde, a boxed observing and transmitting apparatus carried aloft by hydrogen-filled balloons, sometimes as high as 15 miles. When these balloons burst in the rarified upper atmosphere, the radiosondes plummet to earth on little parachutes, flashing vital signals all the way.

Big brother to radiosonde is the automatic weather station, a complete observer and self-powered transmitter that can be set atop a mountain or on a far-off island, or dropped behind enemy lines. This mechanical weather man will grind out regular reports, in its own cipher, for six months.

Along with forecasting methods, map-making has been thoroughly rehashed. Today the Weather Division of the Air Forces has a Visual Presentation Unit in its Special Studies Section. Directing this unit's activities in the Pentagon Building is serious, talented, 37-year-old Ralston Crawford.

Before the war Master Sergeant Crawford was a well-known artist of the abstractionist school, who went in for painting in the stark, modernistic vein. His training stood him in good stead for his present job. To present complex meteorological ideas quickly and clearly, he had to work out new methods of visual presentation. Working with his two pretty assistants—Jane Ferrier and Alida Conover, both artists in their own right—he is turning out striking graphic presentations of weather data, works of art as well as valid scientific charts. Crawford's thorough knowledge of color, tone, distortion and emphasis is saving the Air Forces' Weather Division precious hours in the training of personnel.

A long time ago Mark Twain remarked that everybody talks about the weather, but nobody does anything about it. That observation is not entirely accurate today. American meteorologists *are* doing something about it. They have enlisted it on our side. They are winning the war with it.

To strengthen forgings for airplane motors, the steel is cooled so slowly that it takes several days to come down from its 2000 degrees heat.

"One of the Freedoms I will feel I have earned will be to have a Harley-Davidson under me again"

No letter, among the thousands we have received, is more typically American than this one from Seabee "Lefty" C—

"When I was a civilian, I had a Harley-Davidson. Its performance was superb. Have shore duty here with the Navy Seabees. Harley-Davidsons are used for specialized duties, and they never balk on the most rugged assignments. One of the freedoms I will feel I have earned will be to have a Harley-Davidson under me again and feel the good old American wind biting my face."

Many thousands of motorcycle fans feel the same way, Lefty. Like you, they are earning their freedoms — the hard way. You're all hastening the return of gypsy tours, race meets, hillclimbs and endurance runs. And we can assure you that when those "freedoms" are yours again, the newer, better Harley-Davidsons will really have what it takes to make the good old American wind bite your face! Put every spare dollar into War Bonds — thrill to your own Harley-Davidson after Victory!

HARLEY-DAVIDSON MOTOR CO.
Dept. MI, Milwaukee 1, Wis.

Write for free copy of ENTHUSIAST *MAGAZINE, filled with motorcycle pictures and stories.*

HARLEY-DAVIDSON
MOTORCYCLES

I Was A Congo "Ham"

[*Continued from page 47*]

directed toward New York, just in the opposite direction from Stanleyville.

"I know," he guffawed, "I know. But each night I got every word of yours. In my radio set, just an ordinary one. Every word you said in the microphone, and between yourselves. Best show in my life, I tell you!"

After we had pitched a permanent base camp in the jungle, we made a discovery. In the most intricate bowels of our transmitter we found a horned chameleon which began to hiss and make faces at us the moment we tried to dislodge it from its snug, cozy nest of tubes and transformers. How and when this prehistoric-looking beast had gotten there, nobody knew. How it could have influenced the transmission so that all our efforts had been turned to the sole and exclusive benefit of the District Commissioner, never was explained.

After the discovery of the chameleon and its removal, things began to brighten up. But, on the other hand, other factors might have contributed to the improvement of the situation. Two radio engineers were dispatched to our rescue and worked like fiends for hours. The whole set was removed from the trailer in which we had previously installed it to a special tent on a little elevation. New tubes and crystals were received by airmail at prohibitive cost. We rigged up new antennae which our pygmies, climbing up trees like monkeys, hoisted to the top of three huge trees, the only ones we had left standing in the whole clearing.

Finally, whatever the cause, the thing worked. Finally, the hams of the world had the shock of hearing our voice.

Every night we could spare, Charlie and I worked our station. Instantly, it was as if a magic carpet was flying us at will to New York, to Paris, to London, Cuba, San Francisco, Rhodesia, Chicago, Egypt, Malta, Brazil, Iowa—everywhere we wished.

For a few hours we couldn't even think that we were thousands of miles away from every big city, isolated in a little clearing in the depth of the equatorial jungle, just under the Mountain of the Moon and within sight of the snow-capped, 16,700-foot Ruwenzori. While in that radio tent at night, it was difficult to remember that in the darkness which surrounded us lurked vicious leopards, poisonous snakes, huge hippos and mammoth elephants!

Unfortunately, the feeling was far from reciprocal. Especially with hippos and elephants. Because for years and years they had used that glade as their favorite eating place, the few trees that studded it as their chosen scratching posts. And the fact that we had been compelled to take possession of that clearing because it was the only one around there big enough to contain our huge village of trailers, motorcars, tents, huts and shelters—that didn't seem to make the slightest difference to the beasts.

Despite our noisy presence, despite the sounds and smells of our motors and power plants, back they would come, both elephants and hippos. With such persistence that only the installation of an electric fence would discourage them.

This fence was a single wire stretched around the whole camp on glass insulators perched on two-foot sticks. A special transformer connected with the wire stepped up the current from 120 to 4,500 volts. A contact with that innocent-looking wire, invisible in the darkness, meant a tremendous shock, a blinding spark and a terrific crackling report.

It wasn't in any manner lethal. As I involuntarily proved when one night I stumbled in the wire and was violently flung several feet through space without even getting my legs burned. But it was a rather unpleasant experience. And the static that a spark from that wire could produce in our loudspeaker was something fearful.

It is to that fence that we, our mother station and our global audience owed what could be termed *The Golden Age of Station OQ5ZZ*. Because elephants, it is said, have a good memory. Hippos, leopards and buffaloes seem to have not a bad one, either. The fact is that, after a certain number of experiences with that wire, the jungle denizens sort of decided unanimously to give us a wide berth.

The natural consequence was that we relaxed, got too confident—and therefore careless. And so, after a brief blooming boom, OQ5ZZ was struck by the most fateful, inexorable doom.

No longer content with going on the air as chattering hams, that night we were to do a real broadcast. Announcement. Greetings to our hosts of friends. Playing of records we had made of a battle between lions and hippos. Songs by our boys. A short speech by Charlie. Records we had made of pygmies playing tom-toms and singing. And so on, and so on, for a couple of hours.

"Ready?" asked Charlie, all excited.

"Go!" I answered.

As if in answer to that word, sheer pandemonium broke loose throughout our camp. Shouts rose from the quarters of our porters. Cries answered from the shelter of the night watchmen. The ground began to shake under our feet.

With a determined the-show-must-go-on-at-any-cost expression on his face, Charlie went on chanting in the mike: "Here is OQ5ZZ, calling America on schedule. Hello, Hello. Here is . . ."

My first reaction to the outside confusion was a flashing thought: "The fence." Why wasn't it working? I grabbed my rifle and rushed to the switch. The fence was not connected. I should have had more sense than to pull the switch up, when evidently some elephants or hippos or both were already inside our clearing. I switched on the

fence and ran in the direction of the trumpeting.

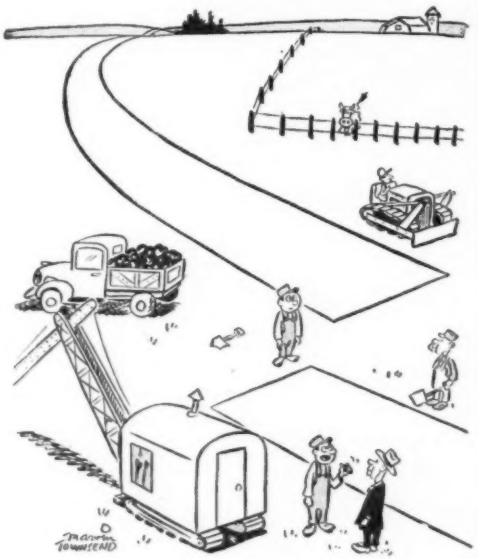
In the misty opalescence of the moonlit night I saw a huge form approaching the tree which held the eastern leg of the antennae. I stopped, took aim and fired. Once. Twice. I fired a third and a fourth time in the direction of other forms emerging from the shadows on the left.

I don't believe I wounded any of the elephants. But the shots brought confusion among their ranks. Immense sparks crackled from the fence. From the radio tent the reports reverberated throughout the camp, amplified a hundred times by the loudspeaker.

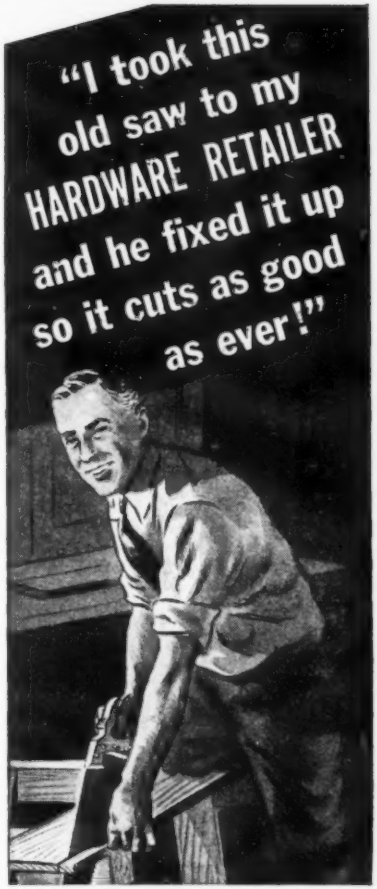
In the radio tent there were no longer lights. In the distance, the power plant, suddenly freed from all its load, raced madly. One of the hippos had stumbled into the heavy cable, torn it away from its locked sockets, sent it flying through space.

Finally the beasts were gone. We all gathered together. I shouted for silence and got it. The confusion was ended. And so was our broadcast. And so was the life of OQ5ZZ. Whatever had happened to our transmitter during those few seconds of pandemonium, we were never able to get it going again. Throughout the world, radio amateurs switched switches and dialed dials, wondering why on earth we had so abruptly vanished from the ether in the very midst of our glory.

None of them realized at the moment that—sad as it was—my brief career as a ham had been rudely, mercilessly ended.



"We just don't see eye to eye!"



"Good tools, like this Disston saw, are mighty hard to get these days, except for essential wartime uses.

"I couldn't get a new one, so I took this old rip-saw to my Disston hardware dealer for sharpening and repair. He did a swell job on it and now it cuts as good as ever."

That's a smart idea these days. Patriotic, too! Good tools are too precious to waste in wartime. Especially a Disston saw, made to give you *extra long* service! Your Disston hardware dealer can recondition any high-quality saw — and tell you about the possibility of securing new tools for *essential* service.

HENRY DISSTON & SONS, INC.

708 Tacony, Philadelphia 35, Pa., U. S. A.

CONSERVE ALL TOOLS UNTIL VICTORY IS WON!

The Disston Saw, Tool and File Manual shows you the right way to use and care for tools. FREE at your hardware store, or write us for your copy.

Cycles Predict The Future

[*Continued from page 43*]

to factors of climate and season which help to shape his energy drive, disease resistance, aggressiveness. Based upon thousands of biographies of eminent persons in *Who's Who*, is the finding that a child has the greatest promise of achievement if he is conceived in the spring. Next best are conceptions during winter cold. Least promising of all are midsummer conceptions.

"Your child stands the best chance of being a success if he is conceived during the season when conceptions are most numerous in your locality," says Dr. Mills.

If it seems fantastic that temperature should affect animal reproduction, consider the egg surplus bestowed upon us by the comparatively mild weather of the past winter. In human beings, the production of the female egg cell is a matter of a 28-day cycle. In the hen, the cycle is about one day long, and easy to observe for the product is visible in the nest. Last winter egg-production did not drop as much as usual. The hen was warmer; she could therefore use for egg production the heat (or energy) which otherwise would have been required to maintain her body temperature.

Man is not immune to similar effects on his reproductive functions. Continuous extreme cold will diminish man's fertility, just as does depressing heat. Exposure for a few hours in an artificial fever machine will cause relative sterility for a month or more. Knowledge of temperature cycles can be important to animal breeders who, by controlling the time of mating, can insure vigorous live litters and thus reduce reproductive wastage.

How can climatic environment affect the energy, life prospects, and physical structure of an unborn child? Dr. William F. Petersen of the University of Chicago, outstanding authority on the effects of weather upon the patient, suggests an answer.

The human egg, although too small to be seen by the naked eye, is not unlike a hen's egg. It contains the equivalent of a yolk, called cytoplasm. When the egg is fertilized, the new body that starts to grow—the very beginning of pregnancy—gets it first raw materials from the cytoplasm.

The external conditions to which the mother's body is exposed (climatic cycles, weather, seasons) modify the chemical composition of the cytoplasm, Dr. Petersen suggests. Thus outside weather becomes internal weather as far as the developing child is concerned. The effects of cycles in solar radiation, sunspot, and climate upon human energies have been discussed in previous issues of MECHANIX ILLUSTRATED. Now it seems clear that every one of us has been affected by such cycles from the very moment that our lives began. We are linked inexorably to great energy cycles from whose dominatim no living thing can be dissociated. Even our heredity may be modified, according to Dr. Petersen. The genes and chromosomes through which we derive our hereditary characteristics from our parents are contained in the fertilized egg. The cytoplasm, swinging through cyclic changes, may well modify the processes of the genes and chromosomes, surrounding them as it does like a nutrient fluid.

The human cycle of gestation is approximately 280 days long, or 10 menstrual cycles. Comparable cycles in animals have been astonishingly modified by scientists through the sole medium of light!

Prof. T. H. Bissonette of Trinity College has caused raccoons to breed twice a year instead of once by exposing them to artificial light cycles in autumn when the days grow shorter. Pheasants were induced to lay eggs in February instead of April. Mink have produced their valuable winter pelt in summer time, speeded by artificial light cycles. Weasels have exhibited two color-changes in their fur when subjected to two light cycles a year.

Researches at Swarthmore College under the auspices of the U. S. Fish and Wildlife Service have shown that artificial light can shorten the period of gestation in fur-bearing animals of the weasel family. Lengthening the light period in the pens of female martens shortened the period of gestation three or four months.

No one has yet dared suggest that such methods could change the length of the pre-birth period in human beings. But the mechanism by which such results are obtained in animals would not seem to preclude the possibility.

Prof. Bissonette explains the startling effect of light-cycles upon animals in this way: light enters the eyes, passes through the optic nerve (as a nerve impulse) which connects directly with the brain, and affects the pituitary gland suspended from the base of the brain. The eye may actually be regarded as an exposed bit of brain tissue.

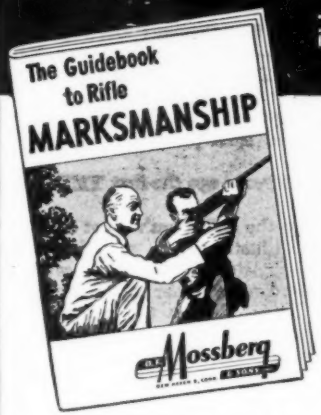
Significantly, the pituitary gland is the master trigger which sets off the reproductive mechanism. In women, the hormones of this tiny gland are vital controllers of the menstrual cycle. Although working in conjunction with other glands, notably the thyroid, it may be regarded as the master timepiece of human reproduction. Its hormones are widely used in obstetrics.

We have hardly begun to explore the full possibilities of reproductive cycles: exact timing of ovulation, consequent ability to space births, timing births to occur on specific dates, lessening sterility, eliminating malformed infants, insuring health, vigor and ability in offspring.

In the meantime, the poet knew what he was talking about when he wrote of June!

How to learn to shoot

. . . under the nationwide pre-induction training program sponsored by the National Rifle Association, Washington, D. C.



TAKE ADVANTAGE of this government-approved program intended to train the maximum number of our citizens in the use of small arms.

Here is invaluable training for all prospective service men, defense units, guards, and others—

Less than 2% of all men inducted into the armed services knew anything about rifled firearms

Shocking but true! Don't be in this class. Familiarity with firearms constitutes a real service to our country now and will stand you in good stead the greater part of your life.

WRITE TODAY for the free booklet shown above, also other literature which tells you how you may get pre-induction rifle training.

O. F. Mossberg & SONS, INC.

4897 St. John Street, New Haven 5, Conn.

Today 100% in war work. In normal times, manufacturers of .22 cal. RIFLES, SHOTGUNS, TELESCOPE SIGHTS, TARGO GUNS & EQUIPMENT.

LESSON IN LOGISTICS:

Mrs. Brown learns why she must *use less paper!*

WHEN Mrs. Brown asked Grocer White why he didn't wrap her loaf of bread in the usual paper bag, he gave her a mighty quick and important answer. He told her how much our armed forces need every kind of paper to wrap the invasion ammunition, weapons, foods and medical supplies in. And Mrs. Brown, of course, was equally quick to see the importance of paper conservation not only at the store but in the home. Now she carries a market basket or shopping bag to save precious paper bags. Not a single piece of paper is wasted at the Brown home. Magazines like this, for instance, are passed along when read. Mrs. Brown is sure doing her duty. Are You?

All the magazines in America, added together, USE only 5% of the nation's paper supply. Yet, out of this comparatively small amount, they are SAVING 450 million pounds this year and RELEASING it for vital war needs.

This advertisement contributed by this magazine and prepared by the War Advertising Council in cooperation with the War Production Board and the Office of War Information.

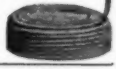
Mortite
YEAR AROUND PLUGGER-UPPER

A pliable Plastic that plugs holes in and around screens, casements, drainboards, sinks, bathtubs, etc. Stops rattles.
In winter weatherstrips windows.

MANY USES IN THE HOME

Keeps out dust and dirt, mosquitoes, flies, ants and other insects.
Easy to apply. Unrolls like ribbon. Adheres to any clean, dry surface. Just press into place and it stays put. Does not shrink, crack or chip.

About 80 feet to a roll. At your Dealer's or $1.25 postpaid.
Send for Circular



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548 Burch St. Kankakee, Ill.

Build These 9 Big 36" Industrial Tr'ng Models

Learn Theory, Design, Construction, Flight Kit T73, "Spitfire"; Kit T74, Messerschmitt ME-109; Kit T76, "Airacobra"; Kit T77, "Warhawk"; Kit T78, "Hurricane"; Kit T85, "Lightning"; Kit T91, "Mustang"; Kit T99, "Typhoon"; Kit T105, "Whirlwind" (illustrated).

Each Kit Only $1.50

At your dealers, or direct (Add 20c pack-post chge.). Send 5c for latest catalog of all C-D War Models.

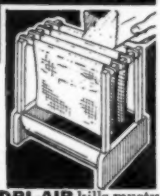
Cleveland Model & Supply Co., 4508D63 Lorain Ave., Cleveland 2, Ohio

BUILD YOUR OWN ARC-WELDER
NO REWINDING NECESSARY
For Light or Heavy Work

We show you how to build this NEW Powerful welder without rewinding. Uses coils taken from old auto generator. Has 20 heats. Operates on either 110 or 220 volts A. C. Learn to weld for defense—defense needs trained men. Complete plan and valuable catalog 35c.

LEJAY MFG. CO. 3314 LeJay Bldg. Minneapolis, Minnesota

END DAMP AIR with DRI-AIR



PROTECT your valuable equipment, tools, foods and furnishings from damage! End dampness in your home or workshop with amazing DRI-AIR. Makes Dry Rooms, Healthful, Pleasant
Place DRI-AIR in any room, basement, storeroom or closet. DRI-AIR absorbs excess moisture from the air. Keeps rooms dry. Prevents mold and mildew. DRI-AIR kills musty odors; stops rust; keeps furniture and woodwork from warping. Complete De Luxe DRI-AIR unit $5.50, f.o.b. Chicago. At your dealer or order direct. Send for FREE booklet "Household Hints in War-Time." Shows how to save food, clothing, fuel.

ANOTHER TAMMS PRODUCT
TAMMS SILICA CO.
228-LX N. LaSalle St., Chicago 1, Ill.

Dirty And Damn Dangerous

[*Continued from page 79*]

been able to give your men are paying dividends today.

"Your ship"—is it a Cruiser? Destroyer? Destroyer Escort? No—wrong, wrong, wrong. You're the skipper of a YMS; a Motor Mine Sweeper: 136 feet of sturdy wooden hull manned by four officers and twenty-eight men—the navy's newest, most versatile and least publicized wood-hulled fighting ship.

She's new: two years ago the first YMS had yet to see sea duty.

She's versatile: the drills you've just completed for the Admiral illustrate how well the YMS is eqiupped with *offensive* weapons that can carry the war to the enemy whether in the air, on the sea, or under it—*in addition* to performing her main defensive job of sweeping mines. And it is this offensive versatility that makes her an important ship for training purposes. For in the rapidly growing sweep fleet are now being trained officers and men who may someday be transferred to the larger sub-busting units of the fleet: PC's, DE's, or Destroyers.

Minesweeping came of age in 1939-40 when Hitler's "secret weapon"—the magnetic mine—made it clear to British naval leaders that the ex-fishing trawlers serving in the Channel as minesweepers had to be supplanted by a vessel especially designed to sweep mines of all types. And when Great Britain had drawn up the plans for the Motor Mine Sweeper, our Bureau of Ships took over these British plans for our own use.

The result? A growing fleet of sea-going vessels that could not only be used for minesweeping, but also for coastal patrol and escort duty up and down our coastline.

Let's get into the shoes of the skipper of a typical Motor Mine Sweeper as he first views his new command. Your ship has already undergone her builder's and navy trials and been accepted by the navy. She's been completed a month ahead of schedule and while she lies at the dock for three days awaiting arrival of her crew, now being rushed to her, you go over her beautifully built 136-foot length from fo'c'stle to fantail. For "Know your ship!" is Rule One in any new skipper's guidebook.

You learn she's built with a 108-foot fir keel, something seldom before found in wood-hulled construction. This feature gives her added structural strength so that if she's ever called on to ram a steel-hulled sub, she can better weather the shock. You learn she has a double-planked fir hull with a two-inch outer planking and a one-inch inner planking—and she's *bolted* together throughout. To be sure, nails or spikes would be less expensive to use—but one mine detonated nearby would pop every nail loose in the hull and the navy could write-off one minesweeper for each mine swept.

You learn she's powered by two lightweight General Motors 2-cycle, 8-cylinder Diesels

Dirty And Damn Dangerous

especially designed for YMS use and considered by experts to be modern miracles of small-packaged horsepower. You learn she's equipped with the very latest developments in heavy-duty minesweep gear, both topside and below decks; that her fuel capacity makes her able to cruise, if necessary, for a week without refueling; that her costly sea-water evaporating plant will provide fresh water.

You learn how to service her expensive Sperry Gyroscope compass and Sperry Hand-Electric steering gear, her powerful two-way short wave radio telephone equipment, her less powerful ship-to-ship radio telephone set, her highly secret degaussing and minesweeping electrical gear, and her sound-powered telephone interior communication system.

During the fitting out period, your guns, secret minesweeping and submarine detection gear are installed under close government supervision. Then you report your ship ready for "shakedown" and take her to a Small Craft Training Center, for a 21-day period of intensive training. Shakedown training of small craft like yours is now handled by a new and extremely efficient command: the Fleet Operational Training Command.

During shakedown, you and your crew are drilled in such exercises as Single Ship Minesweeping Exercises, Formation Minesweeping Exercises, Fueling at Sea, Towing Practice, Passing Mail at Sea, Convoy Escort Practice, Day-Battle Practice, Anti-aircraft Battle Practice, Night Illumination Practice, Small Arms Training and Firing, Aircraft Identification, First Aid Instruction, Radio Drill, Visual Signal Drill, Ship Handling, Anchoring, Anti-Submarine Warfare.

That the jobs performed by the men who man our minesweeps is vitally important is perhaps best expressed by the words of Secretary of the Navy Frank Knox, who said: "The minesweeping service is not a spectacular one. Most of its tasks are carried out far from the fighting fronts. All too often these tasks are dull, dirty, and dangerous—performed in all kinds of weather, day in and day out, the year around. Nevertheless, the job of a man aboard a minesweeper is as vital to victory as that of his comrade aboard a battleship or aloft in a dive bomber. . . . The Navy knows these things and holds the Minesweeping Service in honored esteem. It is a service of the finest traditions—traditions of dogged persistence and selfless devotion to duty. The Navy is counting on every man in it today not merely to maintain these traditions but to add to them new glory and new honor."

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To counteract yellow sunlight in a bright room, a little blue added to paint on the opposite wall evens up the walls in color value.

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Continent Of Tomorrow

[*Continued from page 54*]

leave Montevideo, you may as well bid goodby to all that.

Uruguay is a one-city country. Other towns are small and few in number, with communities widely scattered and crude, especially in the pastoral areas that make up the larger part of the country.

All told, the railways of the whole land placed end to end would not reach from New York to Chicago. The commerce relies on the many river highways. Nearly all the inhabited centers lie within 30 miles of either river or sea. Thus markets are rendered comparatively easy to reach.

Now is the time to begin to make up your mind what line you want to take up in Uruguay. It should not be difficult, once you get free from the attractions of Montevideo, because the interior country is adaptable to just two outstanding pursuits: grazing and agriculture. Nature has never more favored any other land for the taking up of grazing as a livelihood; therefore it is not strange to find that particular pursuit away in the lead. No other republic is so exclusively devoted to a single industry.

Here is the grazing picture in a nutshell. The latitude of Uruguay is approximately that of Florida. The climate however is neither so warm in summer nor so cold in winter. Conversely, August is the coldest month, January the warmest. It is one of the most salubrious and equable climates in the world. Grass is green throughout the year. The ranchero may turn out his flocks and herds without giving a whoop about where they will get their next meal, or a thought as to their shelter. There is not a barn in the back country and you may travel 1,000 miles in cattle and sheep country without seeing a haystack or a feeding trough except on the big estancias. There is such an abundance of water, rich soil and green grass that grazing is a sort of automatic business.

Nature exacts some penalty, however, in thus raising sheep and cattle seemingly without lifting a finger. The native grazer is apt to become careless and shiftless. In permitting nature to do all the work, animals soon get into mischief; get their hides full of ticks and their bodies filled with stock diseases. For these reasons Uruguayan stock has so depreciated that it no longer compares with that of the Argentine, where the greatest of care is given to the sanitation and health of nearly all animals. This becomes a matter of the utmost importance, when you come to consider that wool is one of Uruguay's most valuable sources of income. It is often possible for the astute and industrious newcomer in the ranch business to get ahead of the native oldtimers.

There are many well-organized Uruguayan estancias or stock farms, however, that follow a pattern that soon becomes familiar and is worthy of copying. Near the gate is the small adobe house of the *puestero* whose job it is to keep the gate and

to look after a given pasture. Drive through the gate. From there you pass along an avenue shaded by eucalyptus trees to the house of the *estanciero*. It stands under a grove of shade trees, surrounded by white *galpones*, or barns, used for shearing the sheep and storing the wool. There are stables too for the many horses, and scattered huts for the gauchos and peons. Beyond is a sizable garden and orchard, filled with ripening oranges, peaches, plums, apricots, figs and whatever vegetables and flowers he chooses to raise. Between seasons most of the men are kept employed repairing fences, culling sheep for the shearing or getting them ready for the lambing that usually takes place in April, May and June. It is customary to furnish food to the laborers. A man with a family usually consumes from 70 to 100 pounds of mutton a year.

While a large part of the land could be more profitably cultivated for grain, less than one-sixth is devoted to agriculture. Out of 72,000 square miles, only 2,150,000 acres are under cultivation. The advantages favoring the farmer in Uruguay are far from unattractive. The settler may turn himself to raising any kind of grain that grows. Some farming communities have near-by towns that have electricity and running water, clean streets, parks and even social clubs. Farmers are more civilized and sociable than the overwhelming proportion of gauchos and cowboys on the ranches. These picturesque fellows go about armed and conduct themselves in rude ways that are not always careful of either the law or human life.

All firewood and building woods, together with coal and oil, have to be imported. There is some marble, granite and limestone, just as there is a handful of gold. But there is not enough of any of them upon which to stake a claim or to build an industry.

Meat and animal products account for 95 per cent of export and consumer wealth. The people live on and from their native meats. As you will find it the source of livelihood for the majority throughout the interior, so you will find when you return to Montevideo, that it is also the foundation of the phenomenal wealth that not only built up the richest state per capita south of the equator, but also its capital.

Dried and frozen-meat plants are as common in Montevideo as hat factories are in Danbury, Connecticut. Every year, 1,000,000 head of cattle, 2,000,000 sheep and 100,000 swine, are slaughtered. 1,750,000 ox hides and 100,000 bales of wool are exported annually.

Uruguay is one of the real "lands of opportunity" of the future, but if you're planning to go there after the war and make an easy pile—don't count on it. Competition is going to be so keen for fortune seekers among their own kind after the same big apple, that they will have to be darned good to make good.

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Pottery Fights

[*Continued from page 81*]

however, work hand in hand with inventors, who find it far more practical to test their inventions with models she makes up for them of stoneware.

The potter's clay that is used in this factory is a mixture of the finest qualities of clay mined in all parts of the world. Scotland, England, Turkey and China are some of its sources. In its raw state, it is dumped into a large agitator, looking like a huge washing machine, and this grinds the clay underwater.

The Henderson stoneware is in great demand by war plants and front line repair stations that use the stoneware vats to hold the powerful acids into which fine metal instrument, gun, and airplane parts are dipped for cleaning, prior to plating. Stoneware dipping baskets, made for this purpose, are perforated with fine holes to permit the acid to flow in over the metal parts as they are lowered into the acid vats. Tall cylindrical vats are used for dipping machine gun barrels. The familiar old "Boston Bean Pot" has also gone to war, thousands of them winding up on foreign battlefronts all over the world; and many a returning soldier has confessed to a feeling of nostalgia when, in some remote outpost of the world, he has served baked beans in an honest-to-goodness Boston Bean Pot.

Another stoneware item fighting the war is the Henderson Foot Warmer, a flask-shaped receptacle used to hold hot water and replace the hot water bags in hospitals. Because of the heat-retaining feature of pottery, the foot warmer serves its purpose for 20 hours on one filling of hot water, which is a boon to overworked hospital attendants.

Strangest of items that plays a vital role in the war effort is the rat feeder, a funnel-shaped receptacle scientifically designed to keep the rats—which are used in laboratory experiments, from overeating. Once, a short time ago, the need for these rat feeders was extremely urgent. Long distance wires buzzed excitedly: "How soon can you have the rat feeders ready?—Two hours?—Three hours?" Mrs. Henderson assured them that they would be ready on time—and they were.

The production of pottery in the Henderson Plant owes its speed to many ingenious methods and devises. Many items which go into large scale production are turned on the jiggering machine, a revolving turntable consisting of a cylindrical metal receptacle into which a plaster of Paris mold is set snugly and spun. The clay is then slapped into the hollow part of the mold and roughly pressed out against its spinning sides. Then a wooden cut-out pattern, called a profile, which is shaped to conform with the inside shape and dimensions of the pottery is brought down inside the mold by a lever and serves to cut the clay down to the right thickness. Next, in the case of pitchers, a spout is shaped by hand; the pitcher

Pottery Fights

is then removed from the mold and fitted with a handle. Since the pitchers are used for pouring powerful acids, it is easy to see the importance of attaching the handles properly. A defective handle that might give way easily could bring death to workers handling the acids.

Plates and jar covers are made on the pressing machine. Here a disc-shaped plaster of Paris mold, its upper surface made to conform with the inside dimensions of the plate or cover, is set on the revolving turntable. The clay is then pressed down on this mold and its revolving top surface is shaped by a wooden cut-out which is brought down against it by a lever.

Some irregularly shaped forms of pottery are made by the pouring method. The clay is mixed to a liquid consistency and poured into plaster of Paris molds of the desired pottery shape. Here, by capillary attraction, the clay dries first where it comes in contact with the mold, and when it has dried to the required thickness the liquid center is poured out and the shell inside is left to dry thoroughly.

When the pottery has dried thoroughly, it is glazed by dipping it into a glazing bath, the secret formulas for which have been handed down from father to son. Because of the extremely high temperatures used in firing the Henderson pottery, only blue, brown, and white glazes are used. Other colors wouldn't stand the high temperature of stoneware and would chip off in the kiln.

Once glazed the pottery is next stacked into the kiln and fired to its stone hardness. The Henderson kiln is a huge brick oven 28 feet in diameter and one story high. It holds two and a half freight car loads of pottery at one firing. Nine fire-holes around its walls provide the heat and a flash wall around the inside wall shoots the heat and flames up to the cone-shaped ceiling, from where it comes down through the pottery and goes out through the brick-grated floor, under which a network of arches carry the smoke and flames across to the chimney. During the firing process the doorway and all openings are sealed and from 42 to 48 hours, the average firing period, the kiln is never left alone. All hands take turns at watching the firing progress by looking through peepholes at small test pieces of pottery clay which they can hook out for examination. About 10 tons of coal are consumed at one firing.

When it is over the kiln is cooled very gradually by removing the seals from the cooling holes one at a time. It takes five days to cool the kiln; faster cooling would destroy the entire stock of pottery. Final opening of the kiln is a big event, notices having been sent out to all customers, who flock to the plant to see what new ceramic wonders the Henderson kiln will reveal.

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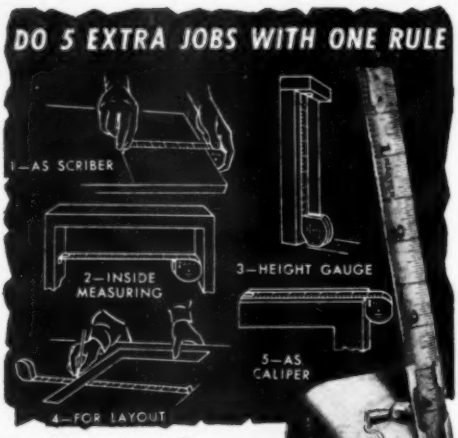

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Two Men On A Torpedo

[*Continued from page 51*]

including Greenland, went to the little ships of the Patrol Fleet, some to the M.T.B.'s and motor gunboats. They finished up together aboard the King Alfred, the R.N.V.R. training ship, after their flair for seamanship had been noted by their officers. When they left the King Alfred they all had the single ring of the sub-lieutenant.

Greenland is 28 years old today, and his Distinguished Service Order is waiting for him when he returns from a prison camp in Germany. His father, who had other plans for Richard's future, admits now that when a boy makes up his mind that the sea is his particular cup of tea there isn't much to be done about it. "We couldn't keep him away from it," says the senior Greenland today.

"I gather that the Italians were a little scared of him when he was taken prisoner. They kept him locked in a Roman fort with only one fellow prisoner, Lieut. Dove, for company. When Mussolini fell he tried to escape, but was captured by the Germans and transferred to a German camp for naval prisoners."

Lieut. Dove is only 22 years old. He was the second of two officers who received the D.S.O. for the Palermo attack. Rodney George Dove is quiet and studious, a fact which appears from the list of books he has requested be sent him at his prison camp through the Red Cross. These books, which are being supplied by the library of his Alma Mater, Dulwich College, include Aristotle's "Politics," Schopenhauer's essays, a life of Dostoevsky, and selections from the works of Emmanuel Kent.

The idea of a human torpedo is not new. The Italians tried the human torpedo idea in an attack on Gibraltar early in this war. The torpedoes were operated by men wearing nothing but crash helmets and cork belts. The crews aimed the torpedoes at the targets and then jumped off to bob around in the water until somebody picked them up. The attack was a failure, but it was possibly inspired by the exploit of Major Rossetti and Lieut. Paolucci who sank the Austrian dreadnaught Viribus Unitus in World War I. On this occasion the secret weapon was something between a mine and a torpedo which was brought to within a mile of the target by a small motorboat, and then drawn close to the battleship by the two officers who were powerful swimmers. They were detected and taken aboard and were still there when the torpedo-mine went off, capsizing the battleship.

The Japanese Admiralty experimented with a human torpedo in 1933, but in this gadget the steersman was inside and necessarily was blown to bits when it struck its objective. This is the good old Japanese way of doing things, and if anything ever came of the 1933 experiments there is no record of it.

Almost as if in reply to the Royal Navy announcement of its use of human torpedoes, the Germans popped up with a version of their own

Two Men On A Torpedo

at the Anzio beachhead a few days later. According to dispatches from the beachhead, Lieut. A. M. Bernstein of Brooklyn was looking out to sea one morning after a hard tour of duty with his ack-ack battery on the coast north of Anzio. He saw what appeared to be a porpoise bobbing up and down in the water. He looked again and saw a tube with a glass dome approaching the shore. Inside the glass dome was a man frantically waving his arms.

When the tube drifted ashore, Lieut. Bernstein broke open the glass dome and out stepped a German in naval uniform with submarine rescue apparatus around his neck. He said he had been dropped by an E-boat further up the coast with the object of attacking Anzio shipping.

The new German weapon was composed of two tubes about 15-feet long. The bottom one is a torpedo, and both have fins and propellers. Apparently the pilot releases the bottom tube when near the target and then veers off in the top one and goes away. The torpedo moves almost under water, but a wake can be seen. Other German torpedoes came ashore at the same time, but no damage was done.

What the future role of the human torpedo is to be in this war is, of course, not known. But the successful attack on Palermo harbor shows clearly that the weapon is powerful and effective and ready to be wielded again whenever our side needs it.

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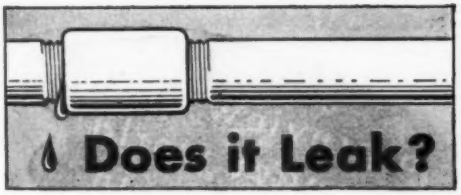

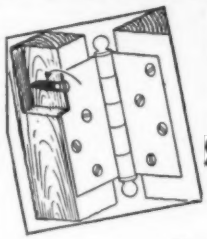

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Editor's Workbench Chips

[*Continued from page* 16]

BOMBS VS. SHELLS: Ordnance expert Willy Ley discusses a vital invasion topic, the comparative merits of bombs and shells, their potentialities and limitations, aided by chart and diagrams which will give you expert information on the burning issue of this and any future wars: Can bombs alone win?

THE GUNNERS HAD THE FUN: A crack London correspondent, Richard Hanser, gives you a vivid picture of what it was like to be below decks on the British cruiser, The Norfolk, when she hunted down and sank The Scharnhorst.

In the Craft & Hobbies Section:

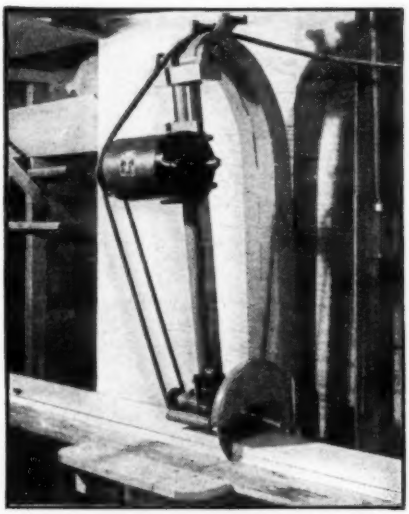
FUNCTIONAL FURNITURE—Build a fine combination bookcase, record cabinet and player console.

MICROPROJECTOR—Simple, powerful homemade microscope with viewing screen attachment for both direct lighting and darkfield projection.

JIG SAW—Round out your power tool equipment with this inexpensive but efficient saw, built from non-priority materials.

THE POTTER'S ART—Second article on pot-

CUT-OFF SAW



Clarence R. Percival, USN. of Redlands, Cal., sends us a photo of a cut-off saw, swing type, which he constructed from used automobile parts. It uses a 10-inch diameter blade and cuts narrow stock up to 3 inches thick and 1-inch material up to 20 inches wide. It's exceptionally well made and should be a valuable asset to any workshop. A $3.00 Workbench award and Certificate of Merit go to Mr. Percival.

Editor's Workbench Chips

tery making at home, with step-by-step instructions for turning clay on the wheel.

All About Jet Propulsion

Just off the press is the first book to deal entirely with the theory of jet propulsion. Titled: Gas Turbines and Jet Propulsion for Aircraft, it is written by G. Geoffrey Smith, M.B.E., editor of two of England's leading magazines. The author

[*Continued on page 156*]

SANDWICH-MOBILE

This contraption with an auxiliary seat for the youngsters is the Victory vehicle of Mr. and Mrs. Alexander Drewicz of Arlington, Mass. The two bicycles are the ordinary variety, while the extra equipment took four months to build and cost only $10. One person steers but both share in the pedaling. Mr. Drewicz has earned a $3.00 Workbench award and a Certificate of Merit.

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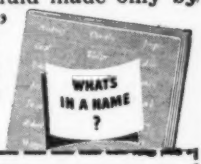

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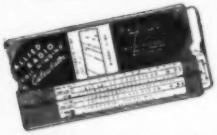

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Editor's Workbench Chips

[*Continued from page* 155]

U.S.S. CHICAGO

Mr. Eddie Rogaski, of Bayonne, N. J., took time off from his business of barbering to build this scale model of the late U.S.S. Chicago. It took eleven months worth of spare time, besides, but it was well spent as you can see from the finished product. It has won him a $3 Workbench award and a Certificate of Merit.

treats this new and intriguing subject in a simple and complete manner, and anyone wishing to keep abreast of the times should read this book at the earliest opportunity. Published by Aerosphere, Inc., 370 Lexington Ave., New York 17, New York; 80 pages; $1.50.

A storage battery in good condition is 100% efficient at 80 degrees temperature, but only 42% efficient at zero, an automotive engineer states.

There are 43 railroads in the United States that operate more than 1,000 miles of road each.

JUNIOR JEEP FOR KIDDIES

This baby Jeep is made of non-critical materials and looks just like the real thing. It carries three passengers and operates on one boy-power; its owner creates a near riot among the neighborhood kids every time he pedals it up and down the walks. The only thing missing that would make this the answer to the gas-rationing problem is the fact that Dad can't get in it. Mr. Wm. H. Fowler of North Hollywood, Cal., gets a $3.00 Workbench award and a Certificate of Merit for being its builder.

Popular Patents

Wind-Tunnel Motor Operates Automatically

A 40,000-horsepower electric induction motor drives air through the great wind tunnel at Wright Field. Not only is it the largest beast of its kind, but also the best tamed. It is part of a large group of powerful machines required for the proper operation of the tunnel.

The operation and control are as far as possible automatic. A few manual operations are required to start the auxiliary machinery. When this is smoothly running, the operator merely sets a pointer on a dial to the desired speed. Automatically the oil pumps are started, switches are thrown, control apparatus brought into play and the great motor is brought gradually and smoothly up to the desired speed and then held there by electronic control.

To change the speed, the operator simply moves the pointer up or down. To stop the motor, he moves the pointer back to zero. During an airplane test, the speed is maintained constant to within 0.3% to 0.5%.

Thin Polarized Plastic Patented

Patents on two inventions in the field of light-polarizing films or sheets have been obtained by Edwin H. Land of Boston, pioneer inventor on devices of this type, and both are assigned to the Polaroid Corporation.

The first of Mr. Land's patents, No. 2,289,713, is on a means of producing thinner films of polarizing plastic than have hitherto been made, but without sacrifice of efficiency. A mass of plastic material, with about 25% of its weight consisting of embedded microscopic needle-shaped crystals, is smeared out on a smooth, flat surface with a knife-edged blade, under considerable pressure.

The pull of the smearing motion causes the tiny crystals to lie parallel to each other and very close together, so that after the film has hardened it is a very good means for "straining" light waves so that all that emerge are vibrating in the same direction, which is the characteristic of polarized light.

Twin superimposed stereoscopic images projected by means of polarized light have in the past been used for producing three-dimensional effects on the screen. The two image-bearing beams are polarized at angles to each other, and the images are viewed through spectacles with corresponding angles of polarization. The result is three-dimensional vision from a flat screen.

In the second of his inventions, No. 2,289,714, Mr. Land extends this effect into three-dimensional colored motion pictures. Each of the two stereoscopic images is registered on a three-layered, three-colored "sandwich film," and the two are cemented together, forming a six-layered sandwich. The spectator, wearing suitable spectacles, sees a single image in full depth and full color.

[Continued on page 159]

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Wear it out...

This year old coats, old shoes, are a badge of honor. They show you're sensible enough to know that one way to keep prices down is to wear your old things out!

Make it do...

Before you spend a penny in wartime, ask yourself, "Do I really need this? Or do I have something now that will do?" As you patch and darn, you keep prices down.

or do without!

When you put your money in War Bonds, in savings, in taxes, in insurance—you're helping to fight the war and build a sound, stable nation for the peace to come.

It's your money you're saving when you help keep prices down. For it's buying too much when there's too little to buy that sends prices up. And when prices go up—and keep going up—your savings, your future, are in danger.

How can you help keep prices down?

By never spending a thin dime you could turn into a War Stamp. By thinking twice—and thinking "No"—at every urge to open your purse.

By wearing old things out, making makeshifts do. Remember, it's the things you *don't* buy that keep prices down!

See that prices go no higher...

Be a Saver—not a Buyer!

HELP US KEEP PRICES DOWN

A United States war message prepared by the War Advertising Council; approved by the Office of War Information and contributed by this magazine in cooperation with the Magazine Publishers of America.

Popular Patents

[*Continued from page 157*]

Weed-killing Machine Uses Flame

Weeds are killed by sheets of flame instead of the conventional steel blades, in a revolutionary new farm implement on which U. S. patent 2,327,204 has just been granted here, to Maj. Price C. McLemore of Montgomery, Ala.

The principle on which the flame cultivator operates is very simple: It jets flame against the ground from pressure oil burners. The flames spread flat as they strike, heating low-growing weeds to the killing point, but having very little effect on the stout stalks of taller crop plants like cotton, cane and corn. Tests already made during the past two seasons, at state experiment stations and on privately owned plantations, show that the flame cultivator can work faster than any other types of weed-killing machines, and of course very much faster than gangs of field hands with hoes.

The revolutionary implication in the new invention lies in the fact that it does not stir the surface of the soil, thereby laying it open to the erosional action of the next rain. Instead, as the weeds wilt and die after the hot breath of the flame has passed over them they form a light mulch that protects the surface.

Economical Sterilizing Lamp

An ultraviolet lamp for quick sterilization of drinking glasses and other utensils, claimed to be much more economical in its use of electric curent than types now in use, is the subject of patent 2,327,142, issued to the well-known scientist-inventor, George Sperti of the Institutum Divi Thomae in Cincinnati.

Present sterilizing lamps, explains Mr. Sperti, require a certain "warming-up" time, while the gases they contain become ionized and capable of producing the germ-killing rays. He surrounds his arcs with an atmosphere already ionized, permitting quicker operation and saving the current normally consumed in the "warming-up" process.

Rights in the patent are assigned to Science Laboratories, Inc., of Norwood, Ohio.

"Spot" Ultraviolet Applicator

For applying ultraviolet rays to particular spots on the body, and especially within body cavities, O. H. Floyd of Chicago has invented a compact applicator on which he has received patent 2,326,773. The gas tube in which the rays are generated does not contain any electrodes; these are provided outside the tube, within a housing into which the tube fits. A long, finger-like projection permits concentrated application of the radiation on the exact areas where treatment is desired.

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Popular Patents

Automatic Seat For Dive Bombers

Dive bombers will be able to pull out of their dizzying plunges with less trouble from the momentarily disabling "blackouts" caused by violent and sudden changes in blood circulation in their brains; such is the promise held out by a Los Angeles inventor, Frederick P. Dillon, on behalf of an automatic pilot's seat on which he has received U. S. patent No. 2,304,781.

The circulatory disturbance which causes a pilot momentarily to lose consciousness, and hence control of his plane, just at the most critical point of the operation, is worse when the pilot is sitting in an upright position, Mr. Dillon states. Therefore he has contrived a seat with a hinged back, which lets the pilot down to a supine position as the plane swoops from steeply down to steeply up. Behind this back is a hydraulic cylinder, which acts automatically to restore the seat (and the pilot in it) to normal sitting position as the plane climbs out of the dive.

Another feature which Mr. Dillon incorporates into his invention is a mechanism that automatically relieves the pilot of his control at the instant he releases his bomb, and turns the job over to the gyroscope control until the danger of the "blackout" is past and he is ready to take over again.

Two Inventions By Service Men

Two inventors now in the armed services, one an officer in the Army, the other an enlisted man in the Navy, have received patents on devices of military value, on which they have relinquished rights, royalty-free, to the government.

Capt. Harry E. Mikkelsen, formerly of West Point but now stationed at Camp Breckenridge, Ky., was awarded patent No. 2,304,841 on a device useful in training young artillery officers. It is customary to save costly ammunition by doing most of the practice shooting on a miniature range, using regular gunsights and laying mechanisms, but firing small-caliber ammunition. In Capt. Mikkelsen's device, compressed air is used instead of gunpowder, further reducing costs and also avoiding fouling the barrel.

Sailor-inventor Richard B. Comstock offers what he calls a diving faceplate for shallow-water work, for patent No. 2,304,798. It consists of an oval frame, deep enough to cover a man's face, with a sponge-rubber cushion around the edge to make a water-tight contact, a glass window to see through, and straps to hold it firmly in place. A hose connection at the top supplies fresh air; foul air passes out of a pair of water-excluding valves at the bottom. The inventor states that for all depths less than 50 feet this simple apparatus does away with the necessity for wearing the costly, cumbrous, copper-helmeted regulation diving suit.

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Your Invention Clinic

[Continued from page 14]

Your perpetual motion invention was illustrated, in principle, as early as 1859 in Gasper Schoot's work. Instead of using long bars, the described invention employed balls and chains. Again, several years later, an invention supposedly was made in the form of floating chambers immersed in water and buoyancy was to be employed instead of gravity.

Whether buoyancy or gravity is utilized makes no difference whatever. Neither method will work.

This can be proved by simple calculation. It has been proved dozens of times with actual, delicately-built mechanisms which continue to stand still.

Our recommendation to you is that you forget about the design. It is 100% worthless.

Colored Poisons

A. R. Condray, Camden, Arkansas, wants to know if he can color certain products and if we recommend patenting.

ANSWER: *In our opinion coloring articles with stripes or spots of paint to differentiate between them generally may be said to be non-patentable.*

This stunt has been carried on for many years, perhaps even for thousands of years.

In the old days medicinal liquids and solids have been colored not only for differentiation but also for the psychological effect offered by the colors. Some of the earliest of medicines were so colored.

On the other hand, it must be stated that certain colors, designed for specific purposes, have been patented. If you want to use those paints, you may have to pay royalties on them. We hold that you will be able to apply colors to items you intend to manufacture without any trouble whatever.

But you state that "a selection of the wrong product under certain circumstances will result in serious or even fatal accidents," and that the differentiation between them will be established by contrasting colors.

It seems a poor practice to us! It might annihilate all color-blind persons in a hurry. Remember that many bichloride of mercury tablets are colored, coffin-shaped, and dispensed in coffin-shaped bottles, yet children might mistake them for candy.

Carbon Monoxide Elimination?

Andrew S. Filewicz, Hartford, Connecticut, submits a large blueprint of a method for eliminating carbon monoxide in automobiles and wants to know if he should spend more money on blueprints and research along the lines of his present thoughts.

ANSWER: *Sprinkling perfume on a skunk does not deodorize the animal. It may mask the smell, if the perfume is powerful enough and the odor of the skunk is quite weak.*

That is precisely what you do. You are adding a perfume to the exhaust gases of an automobile, but you are neither destroying nor eliminating the carbon monoxide. Furthermore, carbon monoxide is absolutely odorless, yet it is deadly if present in the air even to a concentration of only one per cent.

You are not interfering with the carbon monoxide content of the exhaust gases in any way whatever. Consequently, your system does not remove carbon monoxide and is a total and absolute failure.

We advise against any further action along the lines of your present thoughts. The destruction of carbon monoxide is purely a chemical proposition, not an odor-masking system.

Trailer Heater

Julius Smith, Wilmington, California, sends a design for a trailer heater and wants suggestions for improvement.

ANSWER: *The heating arrangement outlined by you will work, of course, but it will not be quite as efficient as if you had a higher heater in the interior of the trailer. If you will substitute an ordinary automobile radiator for the small heater, you will get much better results.*

The heating tank on top of the kerosene burner should be a little deeper than you illustrate. A tank about a foot deep will be excellent. In fact, instead of using a heating tank in this position, it would be much better to use a coil similar to those coils which you can find in the average gas water heater.

Make the connections as follows: Run a pipe from the top of the heating tank, or the top turn of the coil, to the bottom of the auto heater, and then bring the return from the top of the heater down to the bottom of the heating tank.

Near the top of the auto heater, you must arrange an expansion tank. A small T connection at this place, together with a small tank containing water, is all that is required. Now when the water expands on being heated, it will move into the expansion tank. The expansion tank also helps to keep the system full of water all the time, which is absolutely necessary if you expect this type of a unit to function.

In connection with its engineering defense training program, Purdue University is giving intensive courses in chemistry of powder and explosives.

Peanut oil is being increasingly used in shortenings and oleomargarine, due to its superior resistance to rancidity.